Can the big push approach end rural poverty in Africa?

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Insights from Sauri Millennium Village in Kenya

Can the Big Push Approach End Rural Poverty in Africa? Insights from Sauri Millennium Village in Kenya

PROEFSCHRIFT

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door
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Dedication

To my son, Adriel Baraka, for enduring my long absence during my stay in Tilburg.

and

To my parents, Daria and Michael, for believing in the education of a girl child and for supporting me throughout my education.

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Acknowledgement

Writing this note brings a lot of joy because it marks the end of a long journey, an era that took almost 7 years. First, I would like to thank the almighty God for guiding me throughout my studies and for granting me the strength and perseverance to soldier on even when the situation seemed unbearable.

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Bernadete Mukhwana Wanjala
Nairobi, November 2015

Chapter 1: Introduction

The greatest development challenge facing the low-income countries, especially Sub-Saharan African countries, has been making progress towards achieving the Millennium Development Goals (MDGs) by 2015. Sub-Saharan Africa still faces significant challenges in almost all dimensions of poverty and is not on track to achieve most of the goals, even as the MDGs are transitioned into Sustainable Development Goals (SDGs). Meeting the goal of halving poverty by 2015 has been a serious challenge, despite experiencing positive growth rates since 2001. Recent trends indicate that poverty levels for Africa (excluding North Africa) declined from 56.5 percent in 1990 to 48.4 percent in 2010, representing a 14 percent reduction, which was below the MDG target of 28.25 percent (United Nations, 2015). Some countries like Kenya, Zambia, Mauritania and Nigeria recorded notable increases in poverty rates between 1990 and 2010.

It has often been argued in the development discourse since the 1950s that poor countries are caught up in poverty traps and need a "big push" in terms of increased aid and investments to be able to increase their incomes (Sachs, 2005; Sachs et al., 2004). The term "big push" in this context refers to (a) the combination of multiple interventions targeting a few and small-scale locations; (b) the relative massive mobilization of external resources (in relation to available domestic resources); and (c) the assumption that after the "push," the system (community) will shift to another state in which further development would not depend on external support. These "massive" investments are expected to spur savings and to encourage private investment through two main channels. First, household savings and micro finance become feasible as a result of increased household income above subsistence. Second, the existence of good infrastructure is expected to attract additional external private investment.

The big push argument was based on the assumption that poor countries are caught up in a vicious circle of poverty and experience a low-level equilibrium trap where higher income does not increase savings. Foreign aid was thus considered necessary to break this vicious circle, increase productivity and launch a takeoff into self-sustained growth

(Easterly, 2003; Dollar and Easterly, 1999; Erixon, 2005). “Big push” ideas were first developed by Paul Rosenstein-Rodan, who advocated large-scale and externally funded investment in Eastern and Southeastern Europe (Rosenstein-Rodan, 1943). Within this stream, several years later Walt Rostow argued that countries could emerge out of stagnation into self-sustained growth through an aid-financed increase in investment (Rostow, 1959). Big push ideas were therefore initially applied at a much higher scale than rural villages (i.e. at the national level).

Early critics of the big push approach argued that the aid process was so heavily laden with motives of self-interest on the part of donors that it was not clear “who is helping whom,” leading to ineffective outcomes (Kaplan, 1967; Mehmet, 1971). The discussion about the effectiveness of big push approaches has been always intertwined with the debate about the effectiveness of foreign aid. More recently, support for big push propositions in development have been common among academics, who also argue that foreign aid plays a role in fostering growth and poverty reduction, though under certain conditions, such as good policies and properly functioning institutions (Burnside and Dollar, 2000; Hansen and Tarp, 2000; Collier and Dollar, 2002; Sachs et al., 2004; Sachs, 2005). On the other hand, more recent arguments against big push approaches have centered around (i) the lack of evidence about the existence of poverty traps (Easterly, 2005) and (ii) the proposition that aid has been largely ineffective in promoting growth and development (Dichter, 2005; Easterly 2005), based on the observation that a great number of development projects have fared poorly, especially the large-scale and government-initiated projects in sectors such as education, health, credit and infrastructure (Platteau, 2003).

This argument lost credibility for about five decades but made a comeback in the new millennium, motivated mainly by the need for developing countries to meet the Millennium Development Goals. For instance, the UN Millennium Project recommended that “escaping the poverty trap requires a Big Push of basic investments in public administration, human capital and key infrastructure (roads, electricity, ports,

water and sanitation, affordable housing and environmental management"[1] (UN Millennium Project, 2005; Sachs et al., 2004). The IMF and World Bank also called for implementation of the big push through the doubling of Official Development Assistance (ODA) between 2005 and 2010 to support MDGs in low-income countries and Sub-Saharan Africa (IMF and World Bank, 2005).

The launch of the Millennium Village Project (MVP)[2] coincided with the return of the big push approach to development. The MVP was introduced in 2004, following the realization that Sub-Saharan Africa was unlikely to meet the Millennium Development Goals (MDGs) by 2015. The first millennium village (Sauri) was set up in Kenya in August 2004, with other additional villages across Africa. The MVP operates in 80 villages organized in 15 clusters[3] in Kenya, Ethiopia, Ghana, Malawi, Mali, Nigeria, Senegal, Rwanda, Tanzania and Uganda. There were additional MVP sites[4] that were initiated in collaboration with the United Nations Development Program (UNDP) in Madagascar, Mozambique, Zambia, Congo Brazzaville, Cameroon, Benin, Togo, Guinea and Liberia. Tanzania, Mozambique and Guinea have multiple projects, while Niger, Chad and Sudan have the Sustainable Villages Program, which was an initiative of the Islamic Solidarity Fund for Development (ISFD)[5]. See Figure 1.1 for the countries in Africa where millennium villages are located.

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[1] This argument is quite similar to the takeoff hypothesis and the stages of economic growth of the '60s (Rostow's stages of development). The only difference is the level of state intervention.

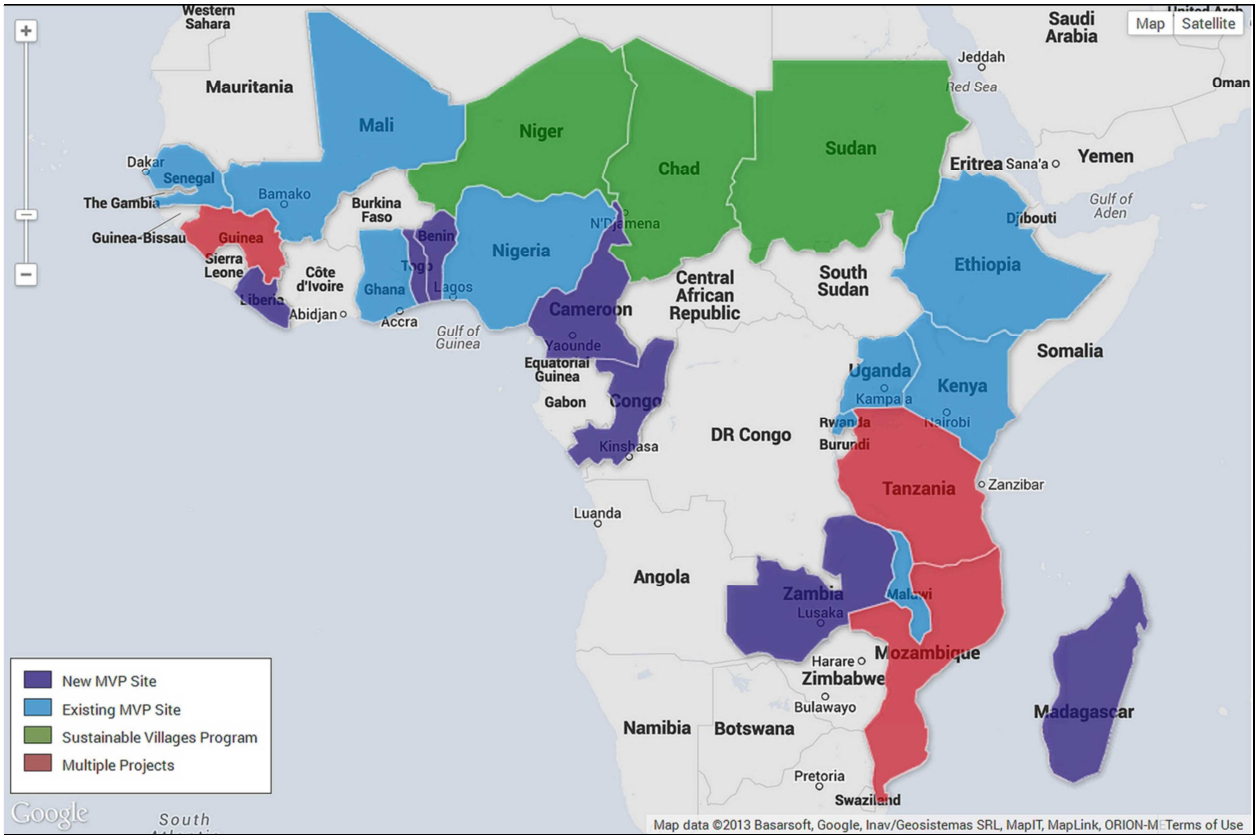
[2] The concept was developed by a team of scientific experts at The Earth Institute at Columbia University and the UN Millennium Project, headed by Jeffrey Sachs.

[3] The villages include: Sauri, Kenya; Dertu, Kenya; Koraro, Ethiopia; Mbola, Tanzania; Ruhiira, Uganda; Mayange, Rwanda; Gumulira, Malawi; Mwandama, Malawi; Bonsaaso, Ghana; SADA, Ghana; Tilby, Mali; Toya, Mali; Potou, Senegal; Ikaram, Nigeria; and Pampaida, Nigeria. See http://millenniumvillages.org/the-villages/ [Accessed July 2014].

[4] These include: Sambaina millennium village site in Madagascar; Konkola in Zambia; Etoro and Obaba in Congo Brazzaville; Maroua and Mevomessi in Cameroon; Banikoara in Benin; Kountoire and Naki East in Togo and Kokoyah in Liberia. See http://millenniumvillages.org/the-villages/ [Accessed July 2014].

[5] See http://isfd.isdb.org/EN/publications/Documents/Corporate%20Brochures/Sustainable%20Villages%20Programme%20(SVP).pdf [Accessed 12 October 2015].

Figure 1.1: Millennium Villages Project sites in Africa



Source: Millennium Promise, 2012

The aim of the Millennium Villages Project was to demonstrate how an integrated approach to community-level development can translate the MDGs into ground-level breakthroughs throughout rural Sub-Saharan Africa (MVP, 2011). The core task of the millennium villages was to "create a community-based implementation system to achieve the MDGs in impoverished rural African populations across many distinct agro-ecological zones while operating within the per capita budget envelope as defined by the international ODA targets and national budget capabilities" (McArthur, Pronyk and Sachs, 2011). The MVP had three broad goals (MVP, 2011). The first and most basic goal was to ensure that all the millennium village communities and local governments achieve all the millennium development goals by 2015. Secondly, the MVP aimed at creating a system of success, which illustrates a well-defined pathway to achieve the MDGs and a toolkit that can be applied in other millennium villages in rural Africa.

Third, the MVP aimed at working with African governments to scale up MVP interventions and achievements and also ensure that the MVP achieves a very important impact on policy design and implementation.

The MVP was based on the assumption that the rural poor in Africa could achieve the MDGs by increasing the stock of capital to the point of self-sustaining growth (UN Millennium Project, 2005; Sachs, 2005; Sachs et al., 2004). Substantial finances (mainly donor-funded – the "big push") have been used in implementing these projects, with an average estimated cost of US$ 110 per person[6] (MVP, 2006). From our sample, the mean income for Sauri was KES 4,737.8 – about US$ 55 (Table 2.2), which shows that the big push was twice as much as the household income. The idea was to increase rural agricultural productivity through targeted public sector investments in natural assets, human capital, infrastructure and financial stocks (Sanchez et al., 2007). In addition to increased agricultural productivity, enhanced diversification into higher value crops and the nonfarm sector would enhance household income, which would in turn spur increased savings and private investment. To enable households to pursue these livelihood strategies, the MVP also emphasized the role of market institutions in both the implementation and sustainability of the investments. There were also interventions in health that were aimed at improving child and maternal health; preventing and treating HIV/AIDS, tuberculosis and malaria; and improving nutrition and providing reproductive health care services. Interventions in health included development and rehabilitation of health centers, hiring and training of health personnel (including community health workers) and distribution of mosquito nets. Interventions in education were aimed at achieving universal completion of primary education and increased access to secondary and tertiary education, especially for girls (Sanchez et al., 2007). Lastly, interventions in infrastructure included development of

[6] Each millennium village required a donor investment of US$ 300,000 annually for 5 years to cover the cost of the interventions (estimated at US$ 50 per villager) and the cost of logistics, community training and monitoring and evaluation (Millennium Villages Project, 2006). Other evidence on funding reveals that the MVP had targeted about 400,000 individuals for 2 and a half years (MVP, 2008). With an estimated cost of US$ 110 per person per year, this translates to a budget of about US$ 88 million within 2 years.

water sources (such as protected springs), rehabilitation of rural access roads and connection of local institutions to the electric grid.

Implementation of the MVP was carried out in two five-year phases. The first phase mainly focused on achieving quick wins, especially in staple crop production and disease control, and establishing basic systems for integrated rural development that would help communities escape the poverty trap and achieve the MDGs (MVP, 2011; Nziguheba et al., 2010; MVP, 2008). The interventions in the first phase included: use of subsidized mineral fertilizers to reverse depletion of soil fertility; provision of subsidized improved seeds; provision of agricultural extension services; construction of grain storage facilities to minimize post-harvest losses; support to schools aimed at increasing primary school enrollment (school feeding programs, provision of sanitation facilities, building of classrooms and provision of school fees bursaries); and access to health, water and sanitation (through construction and equipping of health facilities, construction of protected water springs and construction of sanitation facilities). There were also efforts to enhance access to credit in the first phase through both microfinance and formal banking institutions. The second phase focused more on commercialization of agriculture, promotion of nonfarm activities (especially small-scale entrepreneurship) and enhanced access to output markets (with more focus on collective marketing initiatives).

While substantial resources (about US$ 7 million per village per year – MVP, 2006) have been spent on the project, with substantial scaling-up (to 20 countries in 2014 – Millennium Promise, 2012), there has been no rigorous evaluation of the project to assess whether it was meeting the desired goals. The MVP has over time provided evidence of project quick wins, which have mainly been derived using before and after comparisons (Millennium Promise, 2006; Millennium Promise, 2010). They state that "simple solutions like providing high-yield seeds, fertilizers, medicines, drinking wells, and materials to build school rooms and clinics are effectively combating extreme poverty and nourishing communities into a new age of health and opportunity"[7], yet no

[7] http://millenniumvillages.org/the-villages/ [Accessed 12 October 2015].

rigorous evaluation has been carried out to support this conclusion. The MVP, however, is implementing an end of project final evaluation in 2015 and 2016 with an aim of assessing the MVP's effectiveness in achieving the MDGs by analyzing the associated costs, processes and systems (MVP, 2015). They intend to analyze the project impact by developing the counterfactual using samples of control villages, which is a similar approach to what was adopted in this study. They acknowledge that the project was not designed as a controlled experiment and therefore did not include a control sample in their design. In addition to the lack of rigorous evaluation of the project, key criticisms of the MVP's approach of measuring the quick wins have been due to the lack of attribution of project effects, which has led to calls for rigorous impact evaluation (Clemens and Demombynes, 2010). Other criticisms have regarded the ineffectiveness of using the big push approach to overcome Africa's vicious circle of poverty (Cabral, Farrington and Ludi, 2006; Carr, 2008; Easterly, 2005, 2006), the fact that the MVP was more of a top-down blueprint that was applied across several countries (Rich, 2007) and the MVP's similarities with past rural development initiatives that proved ineffective in promoting and sustaining rural development (Cabral, Farrington and Ludi, 2006; World Bank, 1982; Adelman, 1984; Mellor and Johnston, 1984).

This study sought to provide the first independent rigorous evaluation of the MVP. The study is an ex-post evaluation and therefore applies non-experimental methods (propensity score matching and doubly robust estimator) to assess the impact of the interventions. The use of non-experimental evaluation approaches is widely supported in literature, with previous evidence on impact evaluations of agricultural projects showing that 94 percent of the evaluations used non-experimental approaches (World Bank, 2011). It has also been shown that most evaluations have been in the areas of land titling and technology adoption projects, with limited evidence on the effectiveness of agricultural projects (IDB, 2010).

1.1 The choice of study area and data collection methods

The selection of Sauri as a millennium village was based on the incidence of poverty and hunger in the area (Pronyk et al., 2012; MVP, 2011). The villages reflected a diversity of agro-ecological zones and also represented a range of challenges to income, food

production, disease ecology, infrastructure and health system development. Sauri has been coined as a success story of the MVP across Africa, with major achievements in agricultural productivity, estimated at over a 200 percent increase by the MVP (Millennium Promise, 2006). This therefore makes Sauri an ideal case study to assess the impact of the MVP interventions. The Sauri cluster is located in western Kenya, in Yala Division, Gem District and Siaya County of Kenya. It is located in the Kenya highlands, 1400-1500 meters above sea level, west of the Rift Valley and 30 kilometers north of Lake Victoria. The equator lies just to the south of Sauri (00 06N). Sauri is located 40 kilometers from Kisumu, the nearest city. The cluster consists of a conglomerate of 11 villages, which administratively are sub-locations. These include: Bar Sauri, Anyiko, Nyamninia, Jina, Marenyo, Nyawara, Nyandiwa, Gongo, Ramula, Uranga and Lihanda. The Sauri cluster has a total population of about 60,234 individuals and 13,923 households (Republic of Kenya, 2010). The poverty level[8] for Siaya County, where the Sauri cluster is located, was estimated at 35.6 percent in 2005 (Kenya Open Data, 2014). The county ranks 10 out of 47 counties in terms of poverty (with an average national poverty rate of 47.2 percent) and is therefore not the poorest county. Subsistence agriculture is the primary economic activity among the residents of Sauri. The average farm size is 0.58 hectares, with most households being subsistence farmers (MVP, 2007). The main crop is maize, and other crops include beans, sweet potatoes, bananas, plantains, cassava, kale, tomatoes and onions. In terms of other indicators, Siaya County compares favorably with other counties in its region. For instance, the poverty rates for the neighboring counties, namely, Migori, Kisumu and Homabay counties are 46.7 percent, 47.8 percent and 44.1 percent respectively (Republic of Kenya, 2011). Siaya County also has the highest proportion of population with primary education in its region, which was estimated at 70.3 percent in 2011, compared to a national average of 66.6 percent, Migori county at 68 percent, Kisumu county at 62 percent and Homabay county at 65.6 percent.

[8] The Kenya poverty line in 2005 was 1,562 Kenya shillings (KES) per month (about US$ 19 at an exchange rate of 84 KES per US$ 1) in rural areas, and 2,913 KES per month (about US$ 35) in urban areas.

Data collection for this study was carried out between July and September 2009. A sample of respondents was randomly drawn from 9 of the 11 millennium villages (all except Ramula and Uranga). These two villages were excluded mainly because of logistical reasons, i.e. the villages were far apart. Given that these two villages did not have any features distinctive from the others, we assumed that no significant information was lost by their exclusion.

Respondents for the control group were randomly selected from five neighboring villages, namely Maliera, Siriwo, Malanga, Lundha and Wagai. This sample was considered as a good non-experimental control group mainly for three reasons: (i) it was drawn from the same agro-ecological zone as the millennium villages, (ii) it is within the same administrative unit as the millennium villages (Yala Division, Gem District) and (iii) it would be the next group to be incorporated into the MVP project in any future scaling-up. Data were collected from 236 households within the MVP (out of a population of 11,333 households) and 175 respondents from the control group (out of a population of 6,444 households). Table 1.1 shows the total population and the size of the sample by village.

Additional qualitative data was collected from key informants and focus group discussions, with respondents including MVP local facilitators (2), MVP committee members drawn from the community (5), individual farmers (10[9]), input and output suppliers (5, including the National Cereals and Produce Board, which was located within Sauri), farmers' groups (5 groups), microfinance institutions (2 formal – SAGA and Rabuor Sinaga Community Fund – and 2 informal money lenders) and local government administration (the District Commissioner, the District Officer and 2 local chiefs (heads of locations)). Given that this study is an ex-post evaluation, the study relied on historical information collected from key informants and focus group discussions to assess the before situation, especially for institutional analysis. We had

[9] One was an elite farmer whom the MVP used to showcase its activities, even though his activities were not MVP-related. He got his own grants to initiate projects and train farmers within Sauri, independently from the MVP.

five focus group discussions separately with selected farmers, farmers' groups and MVP committee members.

Table 1.1: Population of sample area

Village	Total population	Total number of households	Number of households sampled
Millennium villages			
Bar Sauri	5,696	1,316	30
Anyiko	4,351	1,015	25
Nyamninia	7,723	1,770	23
Jina	5,381	1,263	23
Marenyo	7,930	1,811	28
Gongo	3,951	871	24
Nyandhiwa	5,059	1,156	33
Nyawara	3,669	858	27
Lihanda	5,612	1,273	23
Uranga	4,381	1,010	0
Ramula	6,481	1,580	0
Total millennium villages	60,234	13,923	236
Control group			
Maliera	6,048	1,363	56
Malanga	6,523	1,517	50
Lundha	4,460	1,058	26
Siriwo	4,368	990	27
Wagai	6,504	1,516	16
Total control group	27,903	6,444	175

Source: Compiled from Republic of Kenya. 2010. Kenya population and housing census: Population distribution by administrative units (Vol. 1A). Nairobi, Kenya: Government Printers.

1.2 Structure of the thesis

The thesis includes three empirical chapters. The first empirical chapter (Chapter 2) seeks to estimate the magnitude of the changes induced by the MVP interventions in agricultural productivity, production margins, food self-consumption and different sources of household income. Given that the study is an ex-post evaluation, the study uses propensity score matching and a doubly robust estimator to estimate the impact of MVP interventions on agricultural productivity and household income (disaggregated into income from: sale of agricultural surplus, small-scale business, wage employment (farm and nonfarm) and remittances). Further analysis is carried out to assess (i) the sensitivity of the analysis to the choice of covariates, (ii) whether spillover effects were significant, which has an implication on the magnitude of the estimated treatments effects, and (iii) the heterogeneity of treatment effects. We find significant MVP effects on agricultural productivity and total household income (including self-consumption) but insignificant cash income effects. The missing link between increased agricultural productivity and household cash income is due to the small sizes of land and large household sizes, with a bigger proportion of production being consumed at home. The chapter concludes that there is a need to test assumptions on which the theories of change are based in order to ensure effectiveness of the interventions.

The second empirical chapter (Chapter 3) builds upon Chapter 2 by assessing whether the MVP effects could be explained by the level of diversification of sources of income. The chapter assesses whether households that diversified their sources of income had higher income, lower poverty levels and higher/lower MVP income treatment effects. The analysis is sub-divided into three sections. The first section estimates the level of diversity and assesses the determinants of diversification (using a tobit model). The second section uses an indirect approach of checking for common causality (because the relationship between household income and the level of diversity is bi-directional) to assess the relationship between the level of diversity and household income and poverty. The last section also uses observed and predicted levels of treatment effects to assess whether households that diversified their sources of income had higher MVP income treatment effects. We find that (i) the average level of diversity in the millennium villages was not significantly higher than the control villages and was quite low in both

groups (a Simpson Index of Diversity of 0.29 for millennium villages and 0.25 for the control group); (ii) the main push factors into diversification were the small sizes of land and large household sizes; (iii) similar variables (especially size of land, household size, dependency, education and access to credit) also explained variations in income and poverty, with the MVP dummy also insignificant for both household income and poverty; and (iv) households that diversified more had lower MVP effects, which likely related to the MVP's focus on agricultural interventions as opposed to the nonfarm economy. The chapter concludes that the insignificant cash income MVP treatment effects were partly determined by the low level of diversification among Sauri households. The chapter lends further support to the argument that the nonfarm economy is important in enhancing household income and reducing poverty.

The third empirical chapter (Chapter 4) builds upon Chapters 2 and 3 by assessing whether the performance of market institutions promoted or undermined the achievement of the MVP goals. The focus of the analysis is on the institutional environment that is relevant to agricultural development within the millennium villages, which includes interactions within (i) input markets, (ii) output markets and (iii) credit markets. We develop a framework that links institutional changes that were induced by the MVP to the key development outcomes. Institutional changes are measured as differences in institutions between the before and after of the MVP (although we acknowledge the limitation of using before and after comparisons due to lack of attribution). This chapter largely uses qualitative research methods, which are supplemented by econometric estimation of (i) the effect of transaction costs on output market access and (ii) the factors affecting access to formal credit. We find that (i) increased access to inputs enhanced agricultural productivity in the first year, but the gains could not be sustained after the phasing out of the input subsidy; (ii) enhancing collective marketing of produce through cereal banks was not successful, given that 10 of the 11 cereal banks collapsed within the first 3 years of operation. Thereafter, there was a transition from cereal banking to marketing cooperatives, which were likely to suffer from the same problems experienced by the cereal banks. Only transaction costs that were associated with the time when prices were known by the seller, the damage to goods during transportation and when actual payment for the goods were made

significantly determined market access; and (iii) interventions in the credit market were not successful, given the low repayment rates of microfinance loans and low uptake of credit financing from commercial banks. Constraints to access to credit (especially lack of collateral and cost of borrowing) were still prevalent in Sauri. The chapter underscores the need for understanding the role of local structural factors that could undermine the effectiveness of interventions. We conclude that institutional bottlenecks in input, output and credit markets also undermined the effectiveness of the MVP interventions.

The last chapter (Chapter 5) provides a key summary of the findings, identifies key emerging issues and provides areas for further research. It also cites the limitations of the study as mainly a lack of baseline and longitudinal data and the use of a small sample. There are three key emerging issues: the design of the project, which is important in facilitating more accurate impact evaluation of the project (random experimental designs are more desirable); the failure to test the assumptions of the theory of change; and whether the gains of the project can be sustained beyond the project period. Areas for further research include an independent end-term evaluation of the MVP and a detailed cost effectiveness analysis of the MVP.

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Chapter 2: Can Big Push Interventions Take Small-scale Farmers out of Poverty? *

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2.1 Introduction

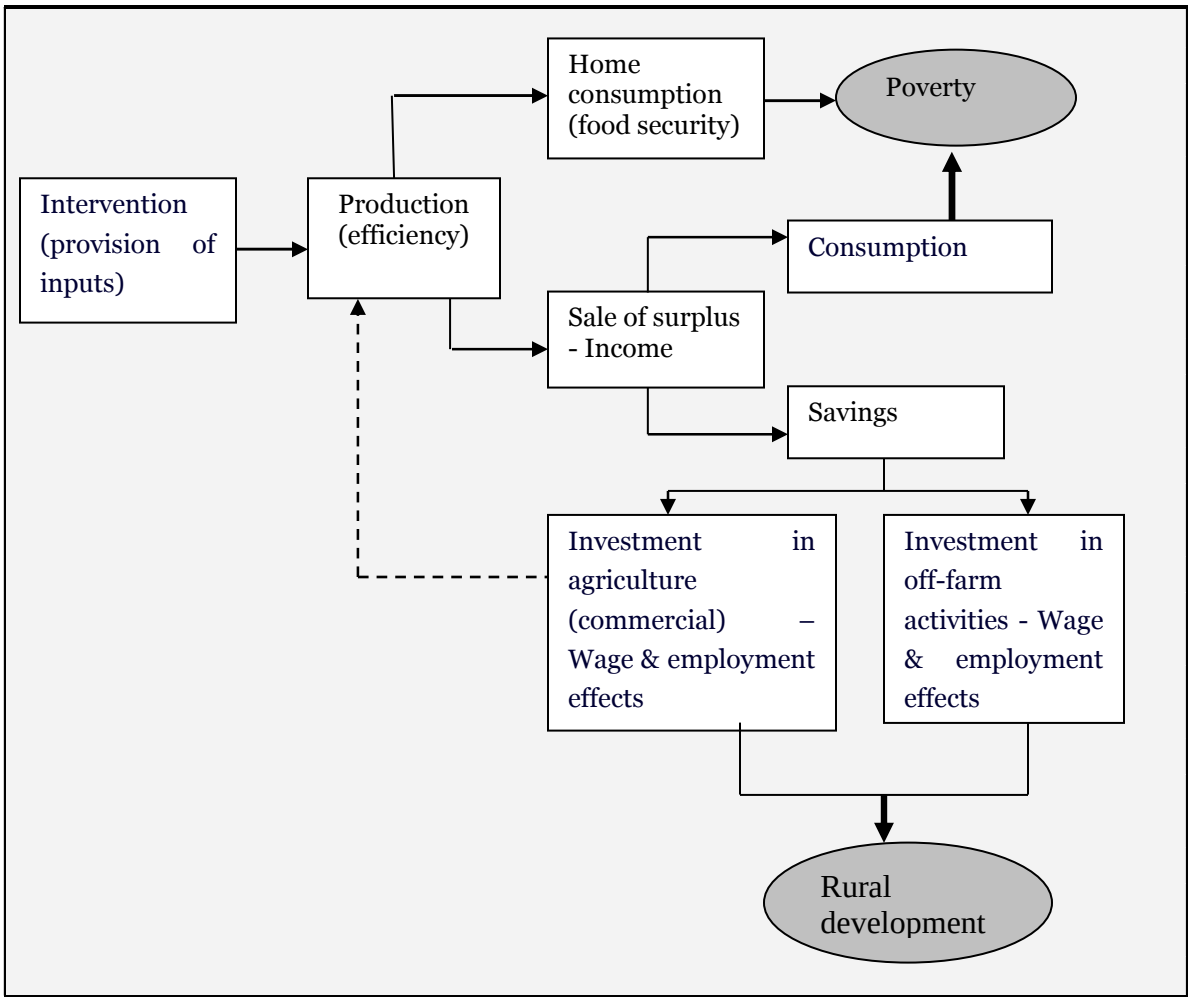
The Millennium Villages Project (MVP) is based on the assumption that Africa's poverty trap could be overcome and the MDGs achieved by 2015 by means of raising the capital stock to the point of self-sustaining growth (UN Millennium Project, 2005; Sachs, 2005; Sachs et al., 2004). It assumes that targeted public sector investments in millennium villages can be used to raise rural productivity, which would increase private savings and investments. This requires a "big push" of basic investments in natural assets (soil nutrients), human capital (skills and health), infrastructure (roads, power and telecommunication) and financial stocks, such as household assets, collaterals and micro finance (Sanchez et al., 2007).

The MVP had an estimated budget of US$ 110 per person. Implementing the intervention in a village like Sauri — with about 60,000 people — costs about US$ 7 million (MVP, 2006). Scaling up such interventions would require a very large mobilization of resources, which would mainly be achieved through foreign inflows. Even though the proponents of the MVP do not explicitly relate their arguments to any particular theory, a closer examination of their approach shows a resemblance to the big push theory, as earlier pointed out by Cabral, Farrington and Ludi (2006), Carr (2008) and Easterly (2005, 2006).

One of the key underlying assumptions of the MVP is that the increase in agricultural productivity would lead to a rise in cash income, which will in turn trigger "self-sustained" local development processes. This causal model assumes that a positive relationship between productivity and cash income will be achieved through two main channels – (i) directly through higher revenues from agricultural sales (in the presence of efficient markets as discussed in Chapter 4) and (ii) indirectly through lower food prices, employment and wage effects in agriculture and employment, wage and income effects in other sectors through production, consumption and savings linkages (Sachs, 2005; Sachs et al., 2004 – summarized in Figure 2.1). These two channels have been identified by a number of studies (Mellor, 1999; Sarris, 2001; De Janvry and Sadoulet, 2002; Minten and Barrett, 2008). In addition, it is reasonable to expect that a higher level of productivity would allow households to allocate a higher amount of production to self-consumption. The latter might also induce secondary positive economic effects if less food expenditure (due to higher self-consumption) enables higher investment in productive assets, for instance.

The MVP is based upon two key sets of assumptions: (1) the effectiveness of "big push" ideas applied to rural villages and (2) taking the agricultural sector as a major driver of economic development. The debate about the role of the agricultural sector in the process of economic development is very old, and the dominant visions have changed considerably over time. During the 1950s, the influential ideas of Arthur Lewis led many scholars to assume that the process of economic development consisted of relocating factors of production from an agricultural sector characterized by low productivity and the use of traditional technology to a modern industrial sector with higher productivity (Lewis, 1954), and therefore neglecting the agricultural sector.

Figure 2.1: Channels through which MVP interventions in agriculture are expected to impact poverty and rural development



Source: Author's own compilation

During the 1960s, nonetheless, these ideas were challenged, and new arguments for giving agriculture a central role as a driver of economic growth were developed, based on stressing its contribution to food supply, national income through exports and farm production, on which a large proportion of the population in developing countries relies (Johnston and Mellor, 1961). An agriculture-led development strategy gained further prominence during the 1980s, following the Asian Green Revolution. Several programs addressing the problems of small farmers were supported through capital and technical assistance from Western donors (World Development Report, 1982). At that time, academic contributions arguing in favor of strong support for the agricultural sector

included the works of Adelman (1984), who proposed an agricultural demand-led industrialization (ADLI) program, and Mellor and Johnston (1984), who stressed that agriculture plays a dominant position as a source of income and employment in low-income countries. Increased agricultural growth was seen not only as a means for providing food to the poor but also as a means of promoting a favorable employment-oriented demand structure (Hazell and Haggblade, 1990). Nonetheless, during the 1990s, when the neoliberal policy agenda gained a prominent place among governments of developing countries, many agricultural support programs were dismantled as part of structural reforms, and the emphasis of the development agenda again shifted away from agriculture.

As stated above, by the mid-2000s policy ideas changed again in favor of massive support for the agricultural sector. Since the publication of the World Development Report in 2008 (World Development Report, 2008), the proposition that agricultural policies and interventions are vital development tools, particularly in Sub-Saharan Africa, has gained momentum. The latter shift was supported by new empirical evidence showing that GDP growth in agriculture is more effective in reducing poverty as compared to GDP growth in other sectors (Khan, 2000; World Development Report, 2008; Christiaensen, Demery and Kühl, 2006) and that agriculture has strong forward linkages, mainly with agro-processing and service industries, and backward linkages with industries that produce agricultural inputs (Anríquez and Stamoulis, 2007). The MVP has coincided then with the return of both (1) the emphasis on the agricultural sector as a major driver of economic development and (2) the "big push" ideas about development.

Nonetheless, another stream of literature has stressed the notion that asset accumulation and income diversification play a major role in rural economic development (Barrett, Reardon and Webb, 2001; Freeman, Ellis and Allison, 2004; Bahiigwa, Mdoe and Ellis, 2005). According to this vision, households are expected to reach a level of asset accumulation above which they can escape poverty (Adato, Carter and May, 2006; Carter and May 2001; Barrett, Carter and Ikegami, 2008; Carter and Barrett, 2006). These studies argue that a combination of productive diversification and

asset accumulation (including land) contributes to the sustainability of rural livelihoods because it improves their long-term resilience to adverse trends or sudden shocks. Furthermore, nonfarm income has been reported to play a significant role in enhancing agricultural productivity, food security and overall household income (Evans and Ngau, 1991; Zerai and Gebreegziabher, 2011; Owusu, Abdulai and Abdul-Rahman, 2011; Gladwin et al., 2001; Omotesho, Adewumi and Fadimula, 2007). Therefore, scholars from this stream tend to be skeptical about interventions and development theories overemphasizing the role of agricultural activities as a tool to take rural households out of poverty. According to Ellis (1999), for instance, it is not reasonable to expect that farm output growth would create plentiful nonfarm income opportunities in the rural economy (via linkage effects) because farming on its own is unable to provide a sufficient means of survival for many poor rural families. Hence, a relevant question is whether the scarce resources of rural interventions should be allocated to enhancing agricultural output or rather to promoting income diversification (particularly from the nonfarm sector). The present study aims to contribute to this policy debate by means of assessing the effects of the MVP interventions.

Agricultural interventions under the MVP in Sauri were primarily aimed at increasing crop yield and reducing food shortages through the training of farmers in improved agricultural techniques and the provision of improved seeds and fertilizers. Implementation of the inputs subsidy program was carried out in phases. During the first year, there was a 100 percent subsidy on inputs, during the second year 50 percent, and during the remaining years no subsidy. Loans from microfinance and formal banking institutions financed the acquisition of inputs during the third, fourth and fifth years. Implementation across the 11 villages was done in two steps. In the first year (2005), a full agricultural subsidy was introduced in Bar Sauri village. In the second year (2006), Bar Sauri received half the agricultural subsidy, with the project being scaled out to the next 10 villages at the same time. This implies that heterogeneity across households in the different villages resulting from differences in the design of program implementation is not large, given that implementation was carried out almost at the same time. In the field of education, MVP interventions have included rehabilitation of

school facilities and the introduction of a school feeding program (cost-shared between the MVP and the community).

There has been an expansion and scaling-up of the program over time, and the interventions have been replicated in other villages across several countries. The MVP uses the before-and-after comparison to attribute changes in the villages to the effects of the project (Millennium Promise, 2010). Success has mainly been measured by an improvement in several indicators, key among them agricultural productivity, health and education outcomes (Millennium Promise, 2006, 2010). However, the major limitation with the MVP's way of measuring impact is that it does not address the issue of causality, i.e. to what extent the outcomes can be attributed to the interventions. Rigorous impact evaluation is therefore needed to show the net effects of this type of integrated intervention (Clemens and Demombynes, 2010). A major issue, however, is that as far as we know, control groups have not been identified by the project before implementation, and therefore any intended evaluation study will face attribution problems.

The present study seeks to carry out an impact evaluation of the MVP at the household level. In particular, it aims to estimate the magnitude of the changes induced by the interventions in agricultural productivity, production margins, food self-consumption and different sources of household income. Given that the study is an ex-post evaluation following a non-experimental design (with no baseline data), propensity score matching and doubly robust estimator methodologies are used to net out the impact of the program. We use a control group that is drawn from neighboring villages to estimate the counterfactual. The millennium villages study group conducted an impact evaluation by comparing the agricultural yields of millennium villages to those of a control group, with the control group being drawn from households that did not use inputs within the millennium villages (Nziguheba et al., 2010). However, we think that this way of identifying control households is problematic due to possible high spillover effects derived from the project's investments in public goods (infrastructure, education, health). A more recent study by the millennium villages study group (Pronyk et al., 2012) also indicated that non-consideration of spillover effects was a major limitation in

their study. We tried to minimize these problems by choosing a control group that is outside but neighboring the millennium villages and also controlling for spillover effects. In addition, we tried to correct for selection bias using a number of econometric techniques, as explained below.

The rest of this chapter is organized as follows: Section 2.2 describes the analytical framework and methodology used. Section 2.3 discusses the empirical findings, and Section 2.4 discusses the results.

2.2 Methodology

2.2.1 Analytical framework

As stated above, all households in the millennium villages are targeted by the interventions of the MVP, which makes selection of a control group problematic. The control group was thus set by means of randomly selecting households in neighboring villages. Propensity score matching (PSM) is used to net out the effect of the interventions. PSM can only be applied when several essential pre-conditions are met (Heckman, Ichimura and Todd, 1997; Cook, Shadish and Wong, 2008; Glazerman, Levy and Myers, 2003). Such pre-conditions are: (i) Data is collected using identical questionnaires for both groups during the same period, (ii) treatment and comparison observations share a common economic environment and (iii) participants and non-participants have the same distribution of observed and unobserved attributes. The approach adopted in this study satisfies the pre-conditions because (i) data for both treatment and control groups were collected using the same questionnaire and at the same time; (ii) both groups share similar poverty incidence and also fall within the same agro-ecological zone, so we can expect that the two groups would have similar productivity levels without the intervention; and (iii) the propensity score function includes similar relevant independent variables for both groups. However, we acknowledge the limitations of using PSM, especially the inability to control for the unobservables.

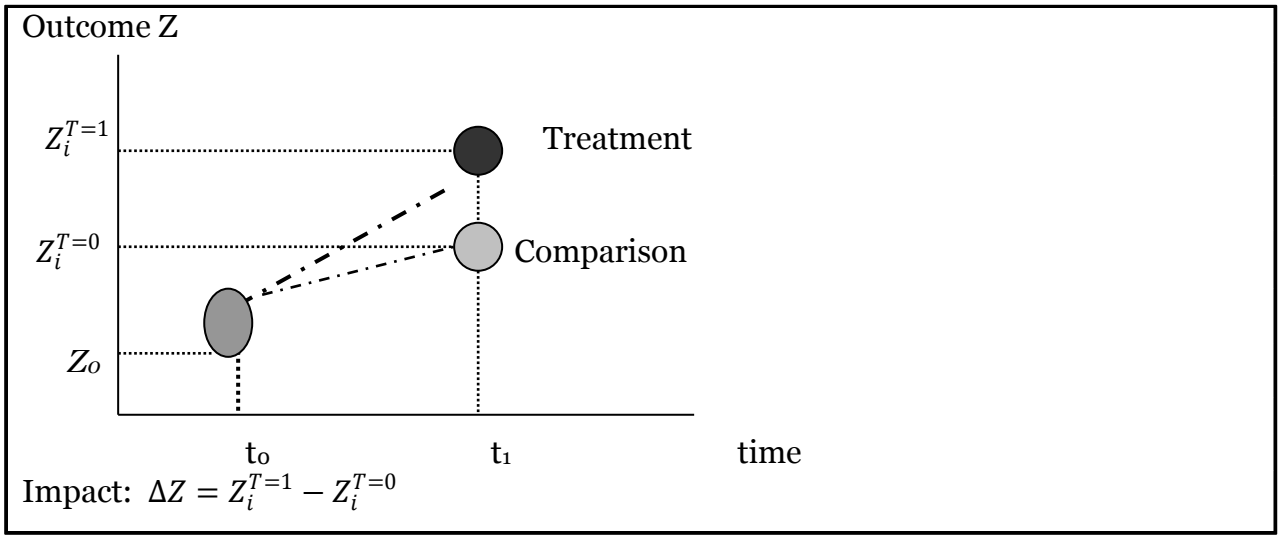
PSM has been used to evaluate the impacts of different programs related to agriculture and food security. For instance, Abebaw, Yibeltal and Belay (2010) examined the impact of a food security program on household food consumption using PSM to control for pre-intervention differences. Using a non-parametric pscore matching technique, Mendola (2005) showed that improved agricultural technology positively affected households' well-being by increasing their income and reducing their propensity to fall below the poverty line. Cunguara and Darnhofer (2011) applied three techniques (regression and matching, sub-classification and regression and the doubly robust estimator) to estimate the impact of improved agricultural technologies on household income in rural Mozambique. Overall, they found that using improved agricultural technologies did not have a statistically significant impact on household income.

To assess the impact of the MVP on an outcome variable (Z), the impact of the intervention is measured as the change in the outcome (ΔZ) that can be attributed to the program (Ravallion, 2005) (See Figure 2.2). Suppose the treatment status is denoted by T, which implies that $T_i = 1$ if household i participates in the program and $T_i = 0$ if the household does not participate in the program (the counterfactual, represented by the control group). The potential outcomes are $Z_i^{T=1}$ for the outcome of the household participating in the program and $Z_i^{T=0}$ for the counterfactual. The change in the outcome that is induced by the program is given by $\Delta Z = Z_i^{T=1} - Z_i^{T=0}$ (see Figure 2.2). The Average Treatment Effect on the Treated (ATET), which is the mean impact on the outcome variable among those households participating in the program, is given by:

$$ATET = E(\Delta Z|T = 1) = E(Z_i^{T=1}|T = 1) - E\left(Z_i^{T=0}|T = 0\right)$$

Even though PSM can be used alone to measure average treatment effects, incorporating regression methods is expected to eliminate remaining biases and to increase precision (Imbens and Wooldridge, 2009; Glazerman et al., 2003). In order to ensure robustness of the results, the doubly robust estimator is used in addition to PSM.

Figure 2.2: Measuring the impact of the program



Source: Adapted from Ravallion (2005) and Adam (2006)

The main hypotheses of this analysis are:

(i) The MVP interventions result in an increase in agricultural productivity.

(ii) The MVP interventions result in an increase in agricultural productivity and household income (homogeneous effect).

(iii) The impact on household income varies across households (heterogeneous effect).

2.2.2 Method of analysis

2.2.2.1 *Propensity score matching*

A standard logit model[10] is used to calculate propensity scores for each participant and the control group (Abebaw, Yibeltal and Belay, 2010; Ravallion, 2005; Ravallion, 2001; Caliendo and Kopeinig, 2008). The model is given by

$D_i = f(X_i)$

[10] There is little guidance on the choice of the functional form of the model that is used in PSM. However, any discrete choice model can be used, even though logit and probit models are preferred over linear probability models (Caliendo and Kopeinig, 2008).

where D_i is the dummy for participation in the MVP and X_i represents the covariates[11] listed in Table 2. Thus,

D_i = *f(sex, age, education of household head, household size, dependency, land, house, employment status of household head, marital status of household head, main source of livelihood)*

For PSM to be applied, two conditions must hold, namely the conditional independence assumption (CIA) and the common support requirement (Caliendo and Kopeinig, 2008). Under the CIA, it is assumed that given a set of observable covariates (X), which are not influenced by the treatment, the potential outcomes are independent of the treatment assignment. This implies that participation in the program is based solely on observable characteristics. The choice of independent variables in this study satisfies this condition, given that they are not influenced by the outcome (participation in the MVP or not). The common support requirement, on the other hand, ensures that households with similar X values have an associated probability (propensity score) of being both participants and non-participants.

To determine the region of common support, this study adopts the minima and maxima comparison, where all the observations below the minimum and above the maximum are deleted. After checking for the conditional independence assumption and common support conditions, each participant i is paired with a group of comparable non-participants (on the basis of propensity scores). The choice of the matching algorithm is important in small samples, because there is usually a trade-off between bias and variance (Heckman, Ichimura and Todd, 1997). We adopt three different matching

[11] It is likely that some of the covariates such as employment status of household head, type of house, household size and source of livelihood would be influenced by the treatment. However, following our field experience, we hypothesize that there were no significant changes in these parameters following the implementation of the MVP. Furthermore, to ascertain whether exclusion of these variables significantly influences the project outcomes, we carry out a sensitivity analysis as discussed in the methodological section.

algorithms to check whether the outcomes are comparable (Caliendo and Kopeinig, 2008): kernel, nearest neighbor (with replacement) and caliper and radius.

The quality of matching was assessed using the standardized bias approach, which compares the bias before and after matching. Checking the quality of matching is necessary to establish whether the distribution of variables is balanced both in the treatment and control groups. If differences between the treatment group and the control group still exist after matching, then it is likely that the matching was not successful, which would be explained by either misspecification of the model or failure of the CIA and common support requirements. There is no standardized measure of success with regard to this approach, but empirical evidence indicates that from three to five percent reduction in bias is satisfactory (Caliendo and Kopeinig, 2008).

The Average Treatment Effect on the Treated (ATET) is calculated as the mean of the specific outcome variable (Z) for participants less the mean for the matched control household, as shown below. The treatment effects were estimated mainly for the following outcome variables: agricultural productivity, production margins, self-consumption and household cash income and total income.

$$ATET = \frac{1}{n}\sum_{i=1}^{n}\left[Z_i^{i\in T=1} - Z_i^{i\in T=0}\right]$$

In addition, ATET was estimated for the various sources of cash income, including: agriculture, small-scale business and self-employment, farm wage employment, nonfarm wage employment and remittances.

Given that PSM does not take into consideration the effects of unobserved variables, the key question is whether unobserved factors can alter the inference about treatment effects. To get insights into this problem, we undertake a bounds test as proposed by Rosenbaum (2002). The bounds test provides evidence of the degree to which the significance of the results hinges on the untestable assumption of insignificant

unobserved effects (Becker and Caliendo, 2007). The matching approach will not be applicable if the results turn out to be sensitive.

To test for the presence of spillover effects, we assess the relationship between the outcome variables (agricultural productivity, production margins, self-consumption and household income) and the distance from the control villages to the nearest millennium village. If strong spillover effects are present, we expect the regression coefficient to be negative and statistically significant, implying that the farther away from the millennium village a control household is, the lesser the productivity or income effect resulting from the intervention. In addition, to estimate spillover effects, we re-estimated the impact by excluding the millennium villages and control villages that are close neighbors. The excluded villages are: Nyawara, Gongo, Lihanda, Siriwo and Wagai. The resulting sample includes 154 MVP and 140 control households. Note that exclusion of these villages reduces the sample size from 412 to 294, which can affect the robustness of the results.

2.2.2.2 Sensitivity analysis

In order to assess how the PSM method influences the outcomes of the evaluation, sensitivity analysis was carried out using different combinations of the covariates. Diaz and Handa (2006) argue that the type of covariates used likely do not influence the outcomes, but may lead to large biases if uncorrected. Bias in this case is mainly reduced by combining regression and matching methods.

2.2.2.3 Doubly robust estimation

According to Funk et al. (2011), the doubly robust estimator requires modeling the relations between confounders and the outcome within each group. The resulting parameter estimates are then used to calculate the predicted outcomes (e.g. income for MVP as $\hat{Y}_1$ and income for control group as $\hat{Y}_0$) both for the MVP (T=1) and the control group (T=0), given covariate values X. The treatment is then modeled as a function of the covariates (as discussed in section (a) above) to derive the propensity scores. The doubly robust estimates are then estimated as shown below.

	DR_1	DR_0
General form	$\frac{Z_{T=1} X\, T}{PS} - \frac{\hat{Z}_1\,(T-PS)}{PS}$	$\frac{Z_{T=0} X(1-T)}{1-PS} - \frac{\hat{Z}_0\,(T-PS)}{1-PS}$
For treated group	$\frac{Z_{T=1}}{PS} - \frac{\hat{Z}_1\,(1-PS)}{PS}$	$\hat{Z}_0$
For control group	$\hat{Z}_1$	$\frac{Z_{T=0}}{1-PS} - \frac{\hat{Z}_0\, X\, PS}{1-PS}$

Here, DR is doubly robust; PS is propensity score; T is exposure to treatment and $Z_{T=0}$ and $Z_{T=1}$ are observed outcomes among individuals with T=0 and T=1, respectively. $\hat{Z}_1$= E(Z/T=1, X) and $\hat{Z}_0$= E(Z/T=0, X).

From above, DR_1 is a function of an individual's observed outcomes when exposed to treatment ($Z_{T=1}$) and predicted outcomes under exposure given the covariates ($\hat{Z}_1$) weighted by a function of the propensity score. DR_0, on the other hand, is the household's predicted response ($\hat{Z}_0$) had they not been exposed to treatment. Finally the means of DR_1 and DR_0 are calculated across the study population.

2.2.2.4 Heterogeneity of effects

Heterogeneity has to do with whether the effect of the program varies according to the household characteristics. We follow the same approach as Abebaw, Yibeltal and Belay (2010) to estimate heterogeneous effects. The individual household treatment effects (TET_i) were regressed against the covariates using the Ordinary Least Squares (OLS) estimation technique. In addition to the covariates, we included an asset index to assess the effect of asset accumulation on the treatment effects. Derivation of the asset index follows from Adato, Carter and May (2006), whereby the well-being of a household (measured as the ratio of household expenditure to the poverty line) is regressed against

a bundle of assets held by the household. The asset index is then derived by weighting the household assets by their marginal contribution to the household welfare and summing across the assets. We use two key productive assets that are used in the millennium villages in the production process, namely land and human capital (using the level of education as a proxy for human capital). Equations were estimated for the different outcome indicators, which included: agricultural productivity, production margins, self-consumption, household cash income and total income.

2.2.3 Definition of variables

Table 2.1 provides a summary of the key household characteristics (covariates) and outcome variables that were used in the analysis, along with their definition and measurement. Key outcome indicators that are measured include: (i) agricultural productivity, which is measured by maize yield per hectare; (ii) production margins (net productivity), which is measured by the (surrogate) monetary measure of agricultural production less production costs; (iii) self-consumption, measured by the (surrogate) monetary value of maize output that is allocated to own consumption; (iv) cash income, which is the amount of monetary income that a household earns in a month; and (v) total income, which includes both the cash income and the surrogate income measure from self-consumption.

Table 2.1: Definition and measurement of variables

Variable	Type and definition	Measurement
Dependent variable		
Treatment	Dummy variable representing participation in MVP	1 if in MVP, 0 if not in MVP
Covariates		
Sex of household head	Dummy, sex of household head	1 if male, 0 if female
Age of household head	Continuous, age of household head	Years completed

Education of household head	Level of education of household head	1 for no education and basic education, 0 for higher education (including secondary school, college and university)
Household size	Discrete, household size	Number of household members
Dependency	Discrete, level of dependence within household	Derived by taking the ratio of economically inactive over active members of the household
Land	Discrete, size of land holding	The size of land owned by household in hectares
House	Type of house	1 for temporary, 0 for semi-permanent and permanent
Employment of household head	Dummy, employment status of household head	1 for employed, 0 for not employed
Marital status of household head	Dummy, marital status of household head	1 for married, 0 for single/widowed/divorced
Livelihood	Dummy, source of livelihood (using major source of income as proxy)	1 for agriculture, 0 for non-agriculture (small-scale business, self-employment wage employment, pension, remittances)
Outcome indicators		
Productivity	Discrete, average yield per hectare of main staple crop per harvest season, which is mostly one season per year (proxied by maize)	Number of bags harvested per hectare of land
Self-consumption	Discrete, surrogate measure of income from household consumption of self-produced food, valued at self-reported market selling prices	Amount of income in Kenyan shillings (KES)

Total cash income	Discrete, average monthly cash income for the household	Amount of income in KES, disaggregated into different sources [agriculture – sale of agricultural surplus, small scale business, wage employment (farm and nonfarm) and remittances]
Total income	Discrete, average monthly income for the household, includes market value of self-consumption	Amount of income in KES, derived by summing total cash income and surrogate measure of income from self-consumption
Agricultural dependency	Discrete, level of dependency on agriculture	Derived by the ratio of agricultural income to total household income
Production margins	Discrete, measure of net value of productivity	Derived by taking the approximate monetary value of total production of maize less total costs of production

2.3 Empirical Findings

2.3.1 Description of household characteristics

There are significant differences between the MVP and non-MVP (control group) households along a number of variables: education level of household head, household size, dependency ratio, type of house, source of livelihood, size of land and also the level of income derived from the sale of agricultural production (Table 2.2). MVP households tend to have better educated heads, a higher number of members, a higher dependency ratio and better housing (more semi-permanent and permanent structures), and to be more reliant on agriculture and hold a larger land size in comparison with the control group.

Table 2.2: Summary of test of significance of the difference of means between MVP and non-MVP households

Variables	MVP households			Non-MVP households			Difference in means [diff = mean(no) - mean(yes)]			t-value
	Mean	STD	SE	Mean	STD	SE	Mean	STD	SE	
Sex	0.7	0.5	0	0.7	0.5	0	0	0.1	0	-0.2
Age	52.7	14.4	1	50.1	16.4	1.2	-2.6	1.5	1.5	-1.7***
Marital status	0.7	0.5	0	0.7	0.5	0	0	0.1	0.1	-0.8
Education	0.7	0.5	0	0.8	0.4	0	0.2	0	0	3.5*
Household size	5.9	2.7	0.2	4.7	2.3	0.1	-1.2	0.3	0.3	-4.6*
Employment status	0.3	0.5	0	0.3	0.5	0	0	0.1	0.1	0.3
Dependency ratio	1.8	1.5	0.1	1.4	1.3	0.1	-0.4	0.1	0.1	-3.0*
Type of house	0.2	0.4	0	0.3	0.5	0	0.1	0	0	3.3*
Livelihood	0.9	0.3	0	0.7	0.4	0	-0.1	0	0	-3.6*
Land	0.5	0.6	0	0.4	0.4	0	-0.1	0.1	0.5	-2.4*
Agricultural productivity	24.8	15.3	1.1	13.6	12.5	1	-11.2	1.4	1.5	-7.8*
Agricultural income	1,449.80	2,086.90	144	843.2	1,884.90	144.1	-606.7	203.8	205.9	-3.0*
Farm employment income	343.8	708.3	48.8	299.4	690.9	52.8	-44.4	71.9	72.1	-0.6
Self-employment income	1,128.50	2,125.70	146.3	1,228.80	2,947.90	225.4	100.3	268.8	260	0.4
Nonfarm wage employment income	1,126.10	2,520.70	173.5	905	5,531.70	423	-221.1	457.2	426.8	-0.5
Remittances	695.3	1,577.10	108.6	712	1,612.30	123.3	16.7	164.3	163.9	0.1
Self-consumption	17,204.00	11,043.00	737.9	8372	8790.1	648	-8832	982	1,003.90	-8.8*
Cash income	4,737.80	3,928.00	271.1	3,988.40	8,224.80	628.9	-749.4	684.9	642	-1.2
Total income	21,972.50	13,182.30	888.7	12,390.70	14,144.90	1,048.50	-9,581.00	664.7	1,365.30	-7.0*
Production margins	16,661.83	19159.81	1,280.17	4,979.97	8,708.37	641.99	-11681.7	1432.1	1527.9	-7.6*
Agricultural cash income to										

production ratio	123.8	12.0	177.6	290.2	48.1	648.9	166.4	45.8	49.6	3.64*
Savings	1234.2	149.1	1738.7	1619.3	792.9	7179.7	385	88.5	644	0.6

Source: Author's own computation from original survey data (2009)

*, ** and *** stand for significance at 1 percent (most significant), 5 percent and 10 percent significance (least significant) levels, respectively.

Furthermore, there are also significant differences between MVP and non-MVP households with regard to the level of agricultural productivity (using maize, which is the staple crop, as a proxy), maize self-consumption (measured by its surrogate market value), cash income derived from the sale of agricultural production and total income (which includes cash income and self-consumption), with MVP households having higher values. However, in both groups the average land size is very small in absolute terms (0.5 hectares for MVP and 0.4 hectares for the control group). In addition, we did not find significant differences between MVP and non-MVP across all the cash income categories (small-scale business/self-employment, farm wage employment, nonfarm wage employment and remittances). The differences reported above cannot, however, be easily attributed to the MVP, due to the possible incidence of selection bias.

2.3.2 Estimation of propensity scores and matching procedure

Three different specifications of the logit model were adopted for the estimation of the propensity score. The results are shown in Table 2.3. Regression results using specification one indicate that households with heads who have no education or only basic education are less likely to be participants in the MVP, while those households with more household members are more likely to be participants in the MVP. In addition, the older the household head, the more likely the chances of being a participant in the MVP.

For specification two, the results are similar to specification one in terms of education of the household head and household size. Furthermore, households with temporary houses (which can be seen as a measure of wealth) are less likely to be participants in the MVP. For specification three, more educated households living in semi-permanent/permanent houses and more reliant on agriculture are more likely to be participants in the MVP.

Table 2.3: Specification of the logit model for estimating propensity scores

Variables	Specification (1) Coefficient (Standard error)	Specification (2) Coefficient (Standard error)	Specification (3) Coefficient (Standard error)
Sex of household head	-0.131 (0.458)	0.117 (0.4885)	-0.086 (0.496)
Age of household head	0.014 (0.007)***	0.007 (0.008)	0.037 (0.050)
Marital status	0.014 (0.450)	-0.189 (0.475)	-0.036 (0.490)
Education of head	-0.717 (0.255)*	-0.583 (0.263)**	-0.549 (0.273)**
Household size	0.137 (0.056)**	0.131 (0.061)**	-0.113 (0.219)
Employment status of head	-0.152 (0.243)	-0.210 (0.260)	0.039 (0.276)
Dependency ratio	0.116 (0.096)	0.119 (0.098)	0.290 (0.220)
Type of house		-0.651 (0.272)**	-0.648 (0.276)**
Source of livelihood		0.131 (0.249)	0.899 (0.317)*
Land size		0.281 (0.261)	0.794 (0.515)
Age of household head squared			-0.000 (0.000)
Household size squared			0.002 (0.019)
Land size squared			-0.184 (0.169)
Dependency ratio squared			-0.027 (0.036)
Constant	-0.773 (0.572)	-0.531 (0.640)	-1.553 (1.442)
Sample size	405	405	385
Psuedo-R^2	0.06	0.067	0.088
LR χ^2 value	32.76	35.44	46.02
Log-likelihood	-257.477	-246.74	-241.44

Source: Author's own computation from original survey data (2009)

*, ** and *** stand for significance at 1 percent (most significant), 5 percent and 10 percent (least significant) significance levels, respectively.

For estimating propensity scores, specification three is chosen mainly because it yields a higher explanatory power (through higher pseudo R^2) and also because polynomial equation specifications yield better estimates of the propensity score than simple linear equations.

Figure 2.3 shows a graphical representation of propensity scores for both the treatment and control groups. The ranges for the treatment and control group are given as:

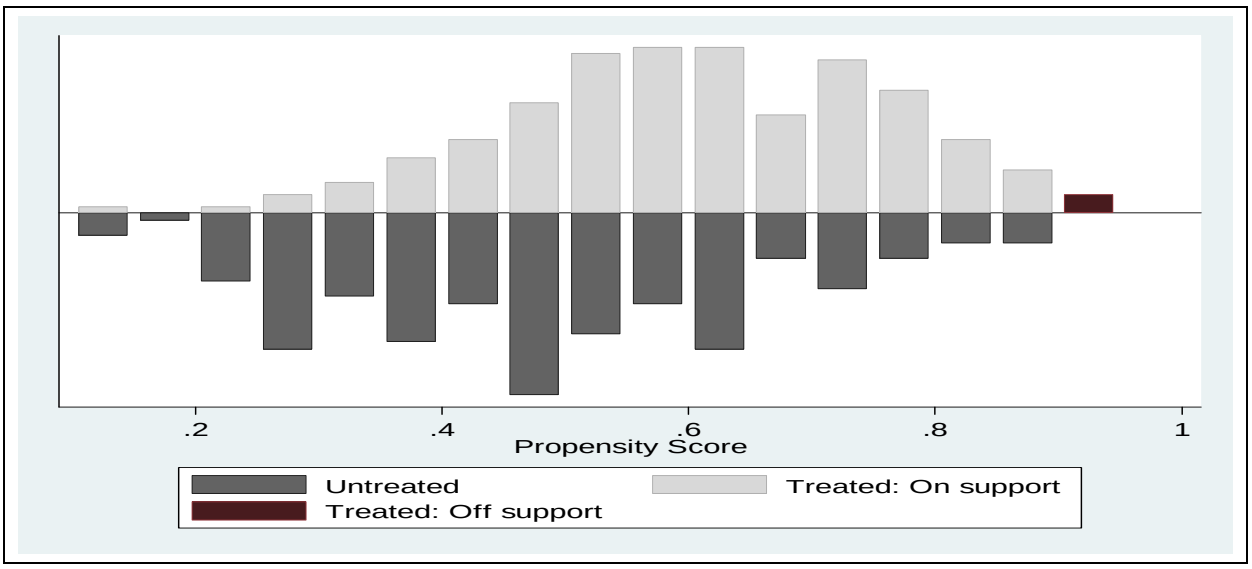
Treatment: 0.1452196 ≤ pscore ≤ 0. 9459737

Control: 0.1400403 ≤ pscore ≤ 0.8851157

Invoking the common support (using the minima and maxima comparison condition) results in the exclusion of only three observations from the treatment group and none from the control group, which is an indication that the common support condition is well satisfied.

The matching procedure was implemented using the *psmatch2* command in STATA, as developed by Leuven and Sianesi (2003). After matching and testing for matching quality, the results indicate that there is a significant reduction in the mean bias, from 21.466 (before matching) to 6.941 (after matching), representing a 72 percent reduction. There is also a significant reduction in standard deviation and variance after matching. We can thus conclude that matching was successful.

Figure 2.3: Graphical representation of propensity scores



2.3.3 Estimation of treatment effects

The results for the estimation of the Average Treatment Effects on the Treated (ATET) of MVP households on agricultural productivity, production margins, self-consumption, cash income and total income are shown in Table 2.4. There are no significant differences in the estimated impact using the three matching techniques (nearest neighbor, radius and kernel matching techniques), which is an indication of robustness. After matching, MVP households have about 70 percent higher productivity (around 10.1 bags per hectare more than the control group). The increase in productivity may be attributed to the use of improved seeds and fertilizer. MVP households spent KES (Kenyan shillings) 1,604 and 3,654 on seeds and fertilizers, respectively, while these figures were KES 1,041 and 1,904 among non-MVP households.

Table 2.4: Estimation of average treatment effects on the treated (ATET)

	ATET[a]
Agricultural productivity	10.1*
Self-consumption	6,501.5*
Production margins	9,760.7*
Cash income from agriculture	446.5
Cash income from farm employment	-6
Cash income from self-employment/small scale business	52.1
Cash income from nonfarm wage employment	444.5
Cash income from remittances	-766.0*
Total cash income	-1896
Total income (cash income + self-consumption)	6,242.2**

Source: Author's own computation from original survey data (2009)

* and ** stand for significance at 1 percent and 5 percent significance levels, respectively.

[a]Matching was carried out using the following: Neighbor (one neighbor), Caliper (0.05, 0.1) and Kernel (0.08, 0.1, 0.25, 0.3).

The effects on production margins, self-consumption and total income (when summing up cash income and self-consumption) are significant, while the effect on cash income is insignificant. The average effects resulting from MVP interventions are: an increase in

self-consumption for MVP households by about 78 percent, an almost 200 percent increase in production margins and a 50 percent increase in total income. The results on production margins should be interpreted carefully, since a surrogate market value of production is used to calculate this variable. However, most households allocate a significant proportion of production to self-consumption, which implies that actual cash margins are not reaped. Decomposing the cash income into various components reveals that there was a significant reduction in remittances – almost 100 percent, which could be due to a perception by relatives that the MVP households are better off due to the implementation of the program and therefore do not require income transfers.

In order to shed some light on the gap between productivity gains and cash income increase, we look at factors explaining the ratio of agricultural cash income to production, as well as at the determinants of other sources of cash income. The agricultural cash income to production ratio is significantly higher among control villages (see Table 2.2). We think that a reasonable explanation is that a considerable share of the productivity gains is allocated to self-consumption among millennium households, thus increasing proportionally more the denominator of the ratio.

Furthermore, we conducted a multiple regression analysis, taking agricultural cash income, non-agricultural cash income, total cash income and agricultural cash income to production ratio as dependent variables. We take as independent variables the asset index, the source of livelihood and household size. The analysis was done for both control and treatment households. The results, which are summarized in Table 2.5, reveal some consistent patterns. Millennium households with a higher asset index are more able to translate higher productivity into increased agricultural cash income.

On the contrary, households with more members tend to have lower agricultural cash income to production ratio, which is likely explained by the fact that they have to allocate a higher proportion of their production gains to feed their members. Household size, however, has a positive effect on non-agricultural cash income and total cash income among millennium households.

Table 2.5: Exploring the relationship between household characteristics, sources of cash income and the agricultural cash income to production ratio

	Agricultural cash income		Non-agricultural cash income		Total cash income		Agricultural cash income to production ratio	
	MVP	Control	MVP	Control	MVP	Control	MVP	Control
Asset index	825.7*	554.0*	1080.5*	1739.6*	1906.2*	2293.7*	28.5***	-42.1
Livelihood	887.3**	1013.3*	-2281.5*	-2420.2***	-1394.2***	-1407	56.7	356.9*
Household size	-53.5	1.6	314.4*	200.9	260.9*	202.4	-10.7**	-4.9
Constant	-587.6	-1092.2*	1520.6***	438.9	933	-653.3	84.0***	132.4
Number of observations	222	180	222	180	222	180	219	180
R-squared	0.11	0.16	0.21	0.09	0.24	0.13	0.04	0.07
Prob>F	0.0	0.0	0.0	0.0	0.0	0.0	0.04	0.01

Source: Author's own computation from original survey data (2009)

*, ** and *** stand for 1 percent, 5 percent and 10 percent significance levels, respectively.

The latter is also affected positively by the asset index, but negatively by specialization in agriculture (households that are not specialized in agriculture tend to have higher total cash income). The positive effect of household size on non-agricultural cash income and total income is only seen among millennium households (not in the control group). This could be an indication that household members have more labor opportunities among millennium villages.

Put simply, our results indicate that households with a higher level of asset accumulation and fewer household members are more able to transmit the productivity gains resulting from the MVP into higher agricultural cash income. The issue is, however, that in Sauri the proportion of households with high levels of assets and small family size is very small. Most households then use the sizeable positive effects of the interventions on agricultural productivity to feed their members. By no means should this be considered a negligible effect. First, the project seems to have contributed significantly to food intake through increased production for self-consumption. Secondly, the resources saved from buying food could be available for investment in productive assets or other basic needs. It is worth noting, however, that a difference in means test for savings (see Table 2.2) shows an insignificant difference between MVP households and the control group, implying that the resources saved from purchasing food will not necessarily translate into higher levels of savings. Third, the positive effect of household size on total cash income among millennium households (which is not the case among control households) probably indicates that the project is inducing positive income effects through labor. This proposition, however, requires further and more appropriate testing.

It is worth noting that among both groups, having non-agricultural activities as the main source of livelihood has a significant positive effect on total cash income. This calls for paying attention to the role of diversification in the economic performance of households. This result suggests that interventions among very small farmers that are mainly focused on productivity enhancement (and neglect the promotion of nonfarm sources of income) are likely to face important constraints when it comes to triggering

local processes of economic growth. The role of diversification is discussed more in Chapter 3.

Table 2.6. Bounds test

Gamma	Q_mh+	Q_mh-	p_mh+	p_mh-
1	.	.	.	.
1.5	-0.061156	.	0.524383	.
2	-0.061156	-0.061156	0.524383	0.524383
2.5	-0.061156	-0.061156	0.524383	0.524383
3	.	.	.	.
3.5	-0.061156	-0.061156	0.524383	0.524383
4	-0.061156	-0.061156	0.524383	0.524383
4.5	-0.061156	-0.061156	0.524383	0.524383
5	-0.061156	-0.061156	0.524383	0.524383
5.5	-0.061156	-0.061156	0.524383	0.524383
6	-0.061156	.	0.524383	.
6.5	-0.061156	-0.061156	0.524383	0.524383
7	-0.061156	-0.061156	0.524383	0.524383
7.5	-0.061156	-0.061156	0.524383	0.524383

Gamma: odds of differential assignment due to unobserved factors

Q_mh+: Mantel-Haenszel statistic (assumption: overestimation of treatment effect)

Q_mh-: Mantel-Haenszel statistic (assumption: underestimation of treatment effect)

p_mh+: significance level (assumption: overestimation of treatment effect)

p_mh-: significance level (assumption: underestimation of treatment effect)

Source: Author's own computation from original survey data (2009)

The results for the bounds test are summarized in Table 2.6. The results are stable and consistently show an insignificant effect of the MVP on household cash income across all the gamma levels. This shows that unobserved effects that would either overstate or

understate the income effects do not have significant implications on the inferences that are drawn from the propensity score matching.

2.3.4 Testing for spillover effects

The results of testing for spillover effects are summarized in Table 2.7. The results indicate that there are no significant spillover effects in agricultural productivity, self-consumption and cash income.

Table 2.7: Testing for spillover effects

	Agricultural productivity	Production margins	Self-consumption	Cash income	Total income
Distance to nearest millennium village	-0.52	-1,095.35*	-818.38	-1,027.76	-1,846.14***
Asset index	-1.61**	3,582.19*	4,441.31*	2,438.07**	6,879.39*
Sex	4.37	3,838.46	3,413.42	1,281.16	4,694.58
Age	20.43**	7,213.70	2,426.21	-8,451.66***	-6,025.45
Marital status	3.12	2,139.80	3,349.16	1,289.62	4,638.78
Household size	1.99**	1,642.39*	664.72	515.61	1,180.33
Employment	1.57	-328.96	87.44	1,454.71	1,542.15
Dependency	-2.06	-2,222.05	185.7	-2,397.38	-2,211.68
Type of house	-1.22	113.36	-1,041.95	-2,532.97	-3,574.92***
Livelihood	2.56	1,634.04	1,795.17***	-3,092.39	-1,297.21
Age squared	-5.29**	-1,698.16	-240.05	2,036.07	1,796.02
Household size squared	-0.09***	-141.88*	-44.89	-18	-62.89
Dependency squared	0.08	498.66	50.28	455.61	505.89
Constant	-9.64	-14,338.03	-8,795.39	16,075.92	7,280.54
Number of observations	169	169	169	169	169
R squared	0.14	0.23	0.39	0.21	0.38

Source: Author's own computation from original survey data (2009)

*, ** and *** stand for 1 percent, 5 percent and 10 percent significance levels, respectively.

However, statistically significant spillover effects were found for production margins and total income at a 10 percent significance level. Re-estimation of the production margins and total income using the sample that excludes neighboring villages yielded an ATET of 9,961.24 for production margins (significant at 1 percent) and 5,254.96 (significant at 10 percent). These results thus show significant differences between the groups along these two variables, indicating possible spillover effects.

2.3.5 Sensitivity analysis for propensity score matching

Sensitivity analysis, using different combinations of covariates, ensures that the impact estimates are consistent. Table 2.8 below shows the results of the estimation of the average treatments effects on agricultural productivity, self-consumption, cash income and total income using different combinations of covariates. Even though there are some differences in the magnitude of the impact, the overall result, indicating a significant impact on agricultural productivity, self-consumption and total income and an insignificant impact on cash income, is stable regardless of the type of covariates used in the analysis.

Table 2.8: Sensitivity analysis of covariates

	Agricultural productivity	Self-consumption	Cash income	Total income
Sex, age, marital status, household size, dependency, land, land squared, age squared, household size squared, dependency squared	10.4*	8,705.3*	-1,388.50	9345.0*
Sex, age, marital status, education, household size, dependency, land, land squared, age squared, household size squared, dependency squared	11.0*	5,728.7*	-751.4	5091.1**

Sex, age, marital status, education, dependency, land, land squared, age squared, dependency squared	11.0*	8,305.1*	931.1	9585.0*
Sex, age, marital status, household size, dependency, land	9.4*	8,417.6*	-782.2	9381.8*

Source: Author's own computation from original survey data (2009)
* and ** stand for 1 percent and 5 percent significance levels, respectively.

2.3.6 Estimation using the doubly robust estimator

The doubly robust estimation, showing a highly significant impact on agricultural productivity, self-consumption, production margins and total income but an insignificant impact on cash income, conforms to the results from propensity score matching (Table 2.9). The variations in the magnitudes of the impacts by the propensity score matching technique and the doubly robust estimator are minimal.

Table 2.9: Estimation using the doubly robust estimator

Covariates	Variable	Effect
Sex, age, marital status, household size, education, employment, dependency, land, house, livelihood	Agricultural productivity	10.6*
	Production margins	8941.8*
	Income from agriculture	190.8
	Income from farm employment	81.9
	Income from small scale business	-98.5
	Income from nonfarm employment	-62.9
	Remittances	-297.8
	Self-consumption	5913.7*
	Total cash income	-193.6
	Total income	5280.7*
Sex, age, marital status, household size, education, employment, dependency, land	Agricultural productivity	10.8*
	Production margins	9882.3*
	Income from agriculture	337.9
	Income from farm employment	62.5

	Income from small scale business	-211.0
	Income from nonfarm employment	-125.1
	Remittances	-200.1
	Self-consumption	6495.1*
	Total cash income	-145.9
	Total income	5807.3*
Sex, age, marital status, household size, education, employment, dependency, land, house, livelihood, land squared, age squared, household size squared, dependency squared	Agricultural productivity	10.8*
	Production margins	8405.3*
	Income from agriculture	144.5
	Income from farm employment	90.6
	Income from small scale business	-51.4
	Income from nonfarm employment	-45.7
	Remittances	-281.1
	Self-consumption	5780.2*
	Total cash income	-152.3
	Total income	5406.5*

Source: Author's own computation

* stands for 1 percent significance level.

2.3.7 Testing for heterogeneity of effects

The results of the analysis of the heterogeneity of effects across households are summarized in Table 2.10. They reveal that the increase in agricultural productivity is significantly larger for households with a household head who is married. Production margins were found to be significantly higher for wealthier households, those with employed male household heads and those with more productive assets. Households with married male heads and larger household sizes were found to have higher effects on self-consumption. We found that only marital status and the main source of livelihood are significant in explaining heterogeneity in the effect on total cash income. Households with married household heads derived more cash income benefits, while households that relied more on agriculture as a source of livelihood derived less income benefits from the MVP, as compared to those who relied proportionally more on other

sources. In addition, male-headed households with less dependency and more productive assets derived more total income benefits from the MVP.

Table 2.10: Heterogeneity of treatment effects

	Agricultural productivity	Production margins	Self-consumption	Cash income	Total income
Asset index	-2.92	6,802.15*	1,566.06	-485.69	3,440.52**
Sex	7.19	8,037.58*	6,639.80**	-469.23	10,997.89***
Age	13.52	-9,827.80	-4,159.70	575.41	-534.04
Marital status	10.04**	6,149.13	6,391.29**	2,419.27***	9,253.84
Household size	2.85	4,086.75**	2,260.31***	-388.2	2,763.21
Employment	-3.45	-7,603.32**	-1,131.72	515.24	-2,725.44
Dependency	2.12	-5,871.86	-7,256.59*	-1,019.75	-9,054.31**
Type of house	-2.32	-7,468.34**	1,649.10	-1,655.33	5,660.64
Livelihood	4.5	3,561.95	-4,751.84	-3,729.77*	-10,582.33**
Age squared	-3.32	2,235.74	1,482.53	10.61	584.68
Household size squared	-0.09	-267.28***	-145.09	17.08	-123.53
Dependency squared	-1.07	828.51	1,264.80**	182.22	1,641.20***
Constant	-22.28	-1,804.95	-10,235.53	7,016.29	-29,856.64***
Number of observations	212	212	212	212	212
R squared	0.06	0.18	0.1	0.07	0.1

Source: Author's own computation from original survey data (2009)
*, ** and *** stand for significance at 1 percent, 5 percent and 10 percent significance levels, respectively.

2.4 Discussion

The high impact on productivity — which has resulted in a higher level of access to staple food — of the MVP is very remarkable, particularly if we consider that these effects have lasted a long time after the initial subsidy on fertilizers has been eliminated.

The awareness of the importance of using improved seeds and fertilizer, created by the MVP through training, seems to have played an important role in inducing these changes. Sauri was chosen as a millennium village on the basis of being a hunger spot, where households experienced food shortages for several months in a year (Pronyk et al., 2012; Nziguheba et al., 2010). Our data reveal that about 57 percent of the households within the MVP had enough maize supply for 10-12 months per year, as compared to only 29 percent of the households in the control villages. This finding is in line with the results obtained by Pronyk et al. (2012).

The MVP also significantly increased total income (which includes cash income and self-consumption). A decomposition of total income into self-consumption and cash income revealed a highly significant effect on self-consumption but an insignificant effect on cash income. This finding is also in line with the results obtained by the millennium study group, who found an insignificant effect of the project on wealth creation, based on an asset index (Pronyk et al., 2012). The insignificant effect on cash income can be attributed to the structural constraints faced by small-scale farmers. First, our analysis reveals that, as expected, household size and an asset index are significant factors affecting the allocation of outputs to self-consumption. Households with larger accumulation of assets and smaller household sizes are more able to allocate agricultural outputs to the market (instead of to self-consumption). We conclude that given the very small size of plots in the study area, only very few households would meet the conditions (enough assets, small family size) to be able to translate productivity increase into higher cash income from agriculture.

As Nziguheba et al. (2010) point out, based on their study of millennium villages, households with very small land sizes have difficulties in meeting their caloric needs even if they use improved seeds and fertilizer and produce yields in the highest quartile. Sachs (2005, p.6) and MVP (2007) also acknowledge the challenges posed by small land sizes in achieving food security and income growth. Several studies (Kuyiah et al., 2006; Ellis and Bahiigwa, 2003; Kibaara et al., 2008) have found that small land sizes could become a significant constraint for increasing the income of farmers. In summary, our results support the proposition that accumulation of productive assets — and

particularly land — is fundamental for poor households to increase their income and escape poverty (Adato, Carter and May, 2006; Carter and May 2001; Barrett, Carter and Ikegami, 2008; Carter and Barrett, 2006).

Nonetheless, despite the gap between productivity and agricultural cash income here described, our results also show that the MVP can induce positive indirect effects on economic welfare. First, households with higher productivity would likely have lower expenditure on food items, implying that more cash is available for investment in productive assets or other basic needs. Secondly, though household size has a negative effect on the agricultural cash to production ratio, we have found that it has a positive effect on nonfarm and total cash income among millennium villages (which is not the case among control households). This probably indicates that there are more sources of nonfarm income among millennium villages. Our data, however, do not allow for testing these hypotheses. Both issues need further investigation with more appropriate methods.

According to our results, specialization in agriculture as the main source of income negatively affects total cash income. As well, households relying more on agriculture benefited less (in terms of total income) from the MVP. As mentioned in the introductory section, several scholars have found evidence supporting the proposition that reducing reliance on agriculture favors income increase and thus provides a pathway out of poverty (Ellis, 1999; Freeman, Ellis and Allison 2004; Bahiigwa, Mdoe and Ellis, 2005; Maltsoglou and Rapsomanikis, 2005; Kuyiah et al., 2006). There is abundant evidence showing that income from nonfarm employment is crucial for food security and poverty alleviation in rural areas of developing countries (Zerai and Gebreegziabher, 2011; Owusu, Abdulai and Abdul-Rahman, 2011; Gladwin et al., 2001; Omotesho, Adewumi and Fadimula, 2007). Our results are line with the proposition that interventions among small-scale farmers that combine productivity enhancement measures in agriculture with the creation of new nonfarm sources of income would likely be more effective in promoting local economic growth as compared to interventions exclusively focused on increasing agricultural productivity. This is explored further in Chapter 3.

A positive relationship between agricultural productivity and cash income among small-scale rural dwellers in developing countries seems to be a logical assumption. However, our empirical results indicate that this key step in the theory of change on which the MVP approach relies might not hold. This has significant implications for a wide range of policies and development interventions in rural areas, particularly for those assuming productivity as a key determinant of cash income in a context of very small land-holding per capita. Our results call for a more careful examination of the mechanisms through which the impacts of agricultural productivity enhancement interventions take place. In general, the risk of large social costs might be high when policies or interventions are rapidly up-scaled without due empirical testing of the key elements of their theory of change. We join Ludwig, Kling and Mullainathan (2011) in their call for a policy evaluation agenda that pays more attention to testing mechanisms – specifically, to empirically assessing the causal relationships upon which policies and interventions are based.

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Chapter 3: The Role of Diversification in Enhancing Household Income and Reducing Poverty among Rural Smallholder Farmers

3.1 Introduction

The role of diversification in increasing household income and reducing poverty is supported by a stream of literature that argues that asset accumulation and income diversification play a major role in enhancing household incomes and reducing poverty[12] (Barrett, Reardon and Webb, 2001; Freeman, Ellis and Allison, 2004; Bahiigwa, Mdoe and Ellis, 2005). Some scholars have argued that farming alone cannot provide the expected additional linkage effects through creation of nonfarm income opportunities, given that it cannot even provide sufficient means of survival for many poor rural families (Ellis, 1999). For rural households with a high incidence of poverty and a largely dominant agriculture sector, increasing household income through diversification is a necessary condition for the implementation of any poverty-oriented development strategy (Minot et al., 2006). In addition, productive diversification and asset accumulation not only provide the means to escape poverty but also contribute to the sustainability of rural livelihoods by improving their long-term resilience to adverse shocks (Adato, Carter and May, 2006; Carter and May, 2001; Barrett, Carter and Ikegami, 2008; Carter and Barrett, 2006). Income diversification also plays a significant role in reducing risk for rural households, especially where consumption and crop insurance markets and safety nets are weak or lacking (Abdulai and CroleRees, 2001).

[12] We also note that income and poverty play a key role, too, in enhancing diversification. Thus, a bi-directional relationship between diversification and household income and poverty is plausible.

There is also research evidence that has shown that nonfarm incomes play a significant role in enhancing rural household income and reducing poverty (de Janvry, Sadoulet and Zhu, 2005; Ellis, 2000). Nonfarm activities have become central to rural livelihoods and should therefore not be regarded as supplementary to the main business of farming (Rigg, 2006). Further, Rigg (2006) argues that the rural south[13] has experienced transformation over time, with changes including the diversification of livelihoods and occupations, the shift of household income from farming to nonfarm activities and the delinking of livelihoods and poverty from farming. There is further evidence that has shown that rural nonfarm income is an important factor in enhancing food security by providing farmers with additional income to invest in productivity-enhancing inputs (FAO, 1998). In addition, development of rural nonfarm agriculture-related activities such as agro-processing, distribution and the provision of farm inputs could increase the profitability of farming by enhancing access to farm inputs and output markets.

While the Millennium Villages Project's (MVP) key underlying assumption was that increased agricultural productivity would enhance household income, they also acknowledged the need to invest in commercial agriculture and nonfarm activities as a means of achieving poverty reduction and rural development (Sachs, 2005; Sachs et al., 2004). The MVP can be seen to be based on two arguments. First, it is argued that agriculture plays a key role in jump-starting growth and increasing household income among smallholder famers. From literature, agriculture has been seen as a vital development tool that can be used to reduce rural poverty through improved agricultural income, increased food security and also through the indirect effect on food prices and employment (Mellor, 1999; Sarris, 2001; de Janvry and Sadoulet, 2002; Minten and Barrett, 2005).

Second, despite the initial focus on agriculture, the MVP also emphasizes that diversification would increase household income and consequently lead to increased savings and self-sustaining commercial activities. Nziguheba et al. (2010, p. 108, paragraph 2) assert that:

[13] South includes Sub-Saharan Africa, Asia and the Latin America and Caribbean countries.

> *Nobody is likely to escape the one-dollar-per-day absolute poverty trap by growing maize on half or one hectare no matter how high the yield. The way forward is crop and enterprise diversification.*

Further, MVP (2006) also outlines the development model by showing that increased diversification (mainly into the nonfarm sector[14]) is expected to lead to higher savings and investments in human capital. It is stated that:

> *This financing model is built on the premise that, with modest support, Millennium Village economies can transition over a period from subsistence farming to self-sustaining commercial activity. Over time, household incomes will rise due to increased productivity, diversification into higher value crops and expanded off-farm employment. Higher incomes will raise household savings, accelerating economic diversification and household investments in human capital.*

The MVP Annual Report (MVP, 2008) also emphasizes the transition from single crop farming to a more diversified farming portfolio and business initiatives, which are largely agro-based. They state that:

> *Traditionally, farmers in the Millennium Villages focused on producing a single staple crop. In its first years, the MVP prioritized dramatically on increasing the production of these crops through subsidized fertilizers, improved seeds, and intensive training in farming techniques. In 2008, increased agricultural yields were sustained, and the project increased its focus on crop diversification to improve both income and nutritional outcomes for farmers and their families* (p. 4, paragraph 3).
>
> *The MVP initiated an intensive investigation to identify viable agricultural production and agro-business development opportunities across the Millennium Villages, including existing businesses that can be enhanced and new businesses that can be launched. Given the rural, agricultural nature of the Millennium*

[14] Sauri households are dominantly smallholder farmers with small sizes of land. Therefore, having a diversified portfolio would entail diversification into the nonfarm sector as opposed to promotion of crop diversification.

Villages, most business opportunities are agro-business initiatives (p. 6, paragraph 3).

Sanchez et al. (2007) also show the MVP's focus on diversification of agricultural crops, commercial farming and business development. They state that:

> *Some of the interventions by MVP in the second phase include a more robust and diversified agriculture and commercial farming (p. 5, bullet 6) and business development through diversifying farm enterprise toward high-value products and linking producer groups to markets and enterprise development through capacity building, access to microfinance and microenterprise institutions (p. 6, bullet 4).*

The MVP asserts that the project will be successful if it demonstrates the feasibility, practicality and effectiveness of integrated investments (mainly financed through global public financial flows) in achieving the millennium development goals[15]. Since its inception, there have been increased financial flows into the project, with scaling-up of interventions across countries. Previous findings in Chapter 2 on the impact of the MVP interventions on household income revealed that the effect of the MVP on household income was insignificant. The MVP theory of change (discussed in the next section) indicates that diversification is the main mechanism through which households can increase their income and reduce poverty. We therefore hypothesize that the cash income effects as derived in Chapter 2 could partly be explained by the level of diversification among Sauri households. Despite the evidence of the MVP's focus on diversification into nonfarm activities as a way of enhancing household income, no attempt has been made to assess the extent to which Sauri households diversified their sources of income and whether diversification (or the lack of it) enhanced (or undermined) the achievement of the MVP goals. This study therefore seeks to fill this gap by analyzing:

(i) the extent of diversification among Sauri households and determinants of diversification

(ii) the impact of diversification on household income and poverty in Sauri

[15] See http://millenniumvillages.org/the-villages/

(iii) whether households in Sauri with more diversified income portfolios necessarily had greater MVP household income effects.

The rest of the chapter is organized as follows. Section 3.2 provides a background of the Millennium Villages Project by highlighting key interventions that are related to diversification of activities. Section 3.3 discusses the conceptual framework and reviews studies that have been carried out on the extent and determinants of diversification and the effect of diversification on household income and poverty. Section 3.4 outlines the methods of analysis for estimation of diversity indices, determinants of diversification, effects of diversification on household income and poverty and the impact of diversification on MVP income effects. Section 3.5 presents the results of the analysis. First, we present summary statistics showing the difference in means between households that participated in farming alone and those that participated in both farming and nonfarm activities. Further, we also present the results of the effect of diversification on household income and poverty and MVP income effects. Lastly, section 3.6 discusses the findings and concludes the chapter.

3.2 The Millennium Villages Project and interventions aimed at enhancing diversification of activities in Sauri

Across all the millennium villages in the Sauri cluster, interventions in the first phase of two years were generally aimed at increasing the productivity of the staple crops, while interventions in the second phase were aimed at triggering the transition from subsistence farming to diversified agriculture and nonfarm activities (Nziguheba et al., 2010). The focus of the first year was on increasing food security and surplus for income generation (MVP, 2006). By the second year, the focus changed to "agriculture as a business," where the farmer was to produce not only surplus for income but also a diversity of crops and livestock enterprises (MVP, 2008, 2006). Two particular areas were emphasized to promote agriculture for income generation. First, market linkages for income generation from surplus staple crops were promoted. For Sauri, surplus

maize cereal was mainly sold to the National Cereals Produce Board and also to organizations such as schools (for school feeding programs) and hospitals.

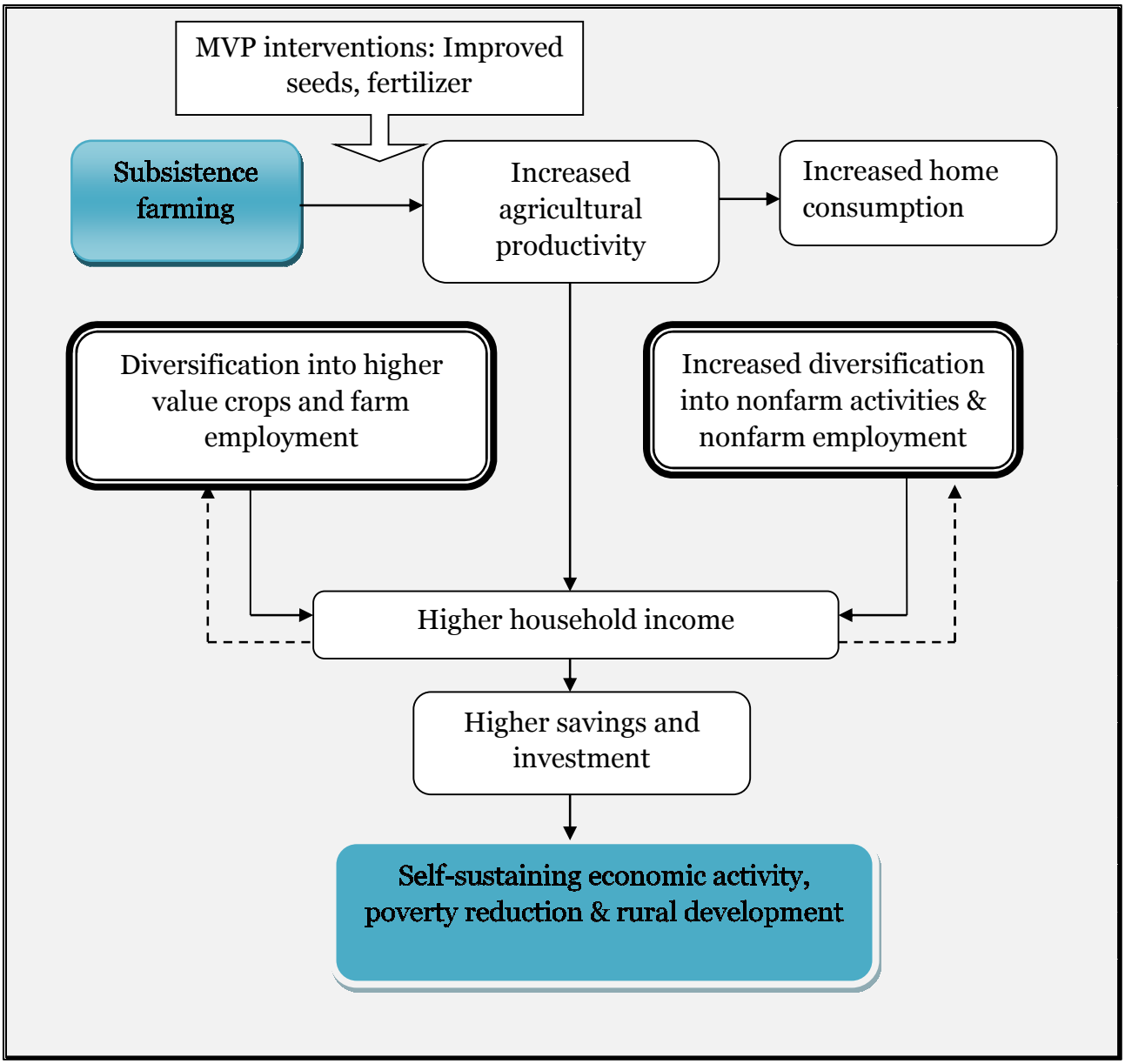
Second, efforts were made to promote crop diversification into high-value crops. The main reasons for promoting diversification were to increase household income, to provide farmers with multiple sources of income that would mitigate against shocks and cushion them against low prices during harvest seasons and also to improve nutritional outcomes (MVP, 2008). Diversification from staple crops to cash crops was also required to support the transition from subsistence farming to commercial agriculture (MVP Sector Strategy, n.d.). This was fundamental for the development of business and entrepreneurship, which was regarded as necessary for sustaining the gains of the MVP. To support the diversification process, the MVP focused on, first, the identification of appropriate crops through market studies, which took into consideration factors such as climate and soils, profitability and market demand at the local, national and regional scale (MVP Sector Strategy, n.d.). The farmers were then trained in the best agronomic practices for each crop. Second, it focused on enhancing access to loans and savings, which was essential for farmers to invest in farm diversification and commercial farming.

Crop diversification was to be achieved through formation of producer groups, training and field demonstrations, with initial producer groups focusing on bananas, tomatoes and onions (MVP, 2006). Through producer groups, farmers could access credit and produce output that would then be jointly marketed. The MVP provided necessary inputs (such as banana plantlets and onion seedlings) and training. In 2005/06, about 387 farmers were targeted for growing of bananas and a total of 707 tissue culture plantlets were procured by the MVP (MVP, 2006). About 159 farmers were trained in onion farming and provided with 500 onion seedlings each, while the tomato producers group had 58 farmers who were trained and provided with chemicals for spraying but had to purchase their own seeds.

Figure 3.1 summarizes the theory of change by the MVP, which highlights the expected mechanisms through which increments in agricultural productivity could be translated

into increased household income and poverty reduction. Initially, interventions in small-scale subsistence agriculture were expected to lead to increased agricultural productivity. Increased agricultural productivity would increase unmarketed home consumption and also lead to increased household income mainly through sale of agricultural surplus.

Figure 3.1: The MVP's theory of change and the role of diversification



Source: Author's own compilation

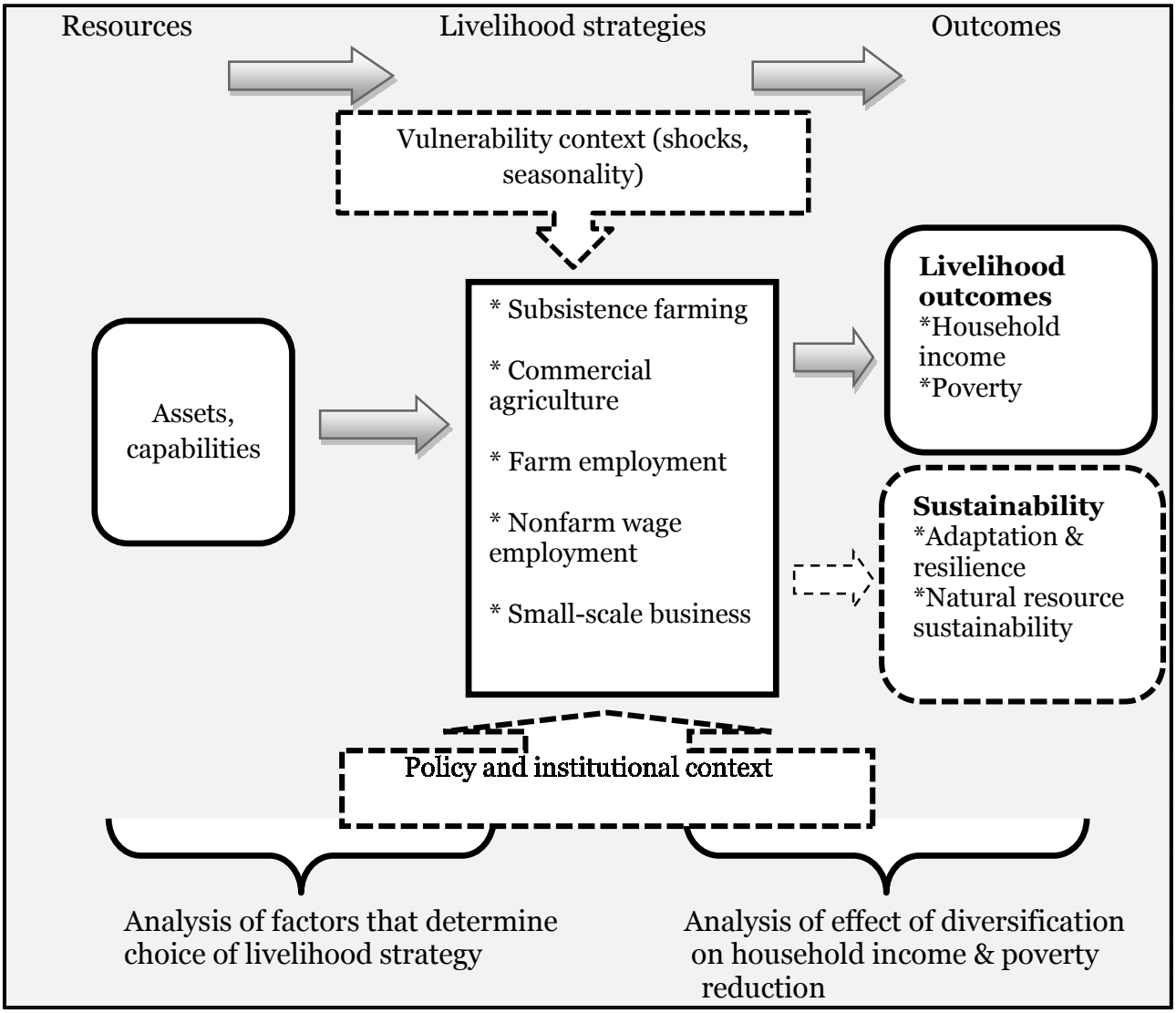
Diversification into commercially-oriented farming (especially higher value crops) and nonfarm activities was pursued as a way of enhancing household income. This was achieved through MVP subsidies in agricultural inputs for non-staple crops and training in improved agricultural practices for commercially-oriented crops. There were also efforts to increase access to credit as a way of providing capital for investment in crop diversification and nonfarm activities. We also take note of the feedback effects of household income into diversification where higher household incomes would necessitate more diversification. Lastly, increased household income was necessary to spur household savings and investment, which would enhance participation in self-sustaining commercial activities and lead to poverty reduction and rural development.

3.3 Review of literature on diversification and its impact on household income and poverty reduction

3.3.1 Conceptual framework

This chapter focuses on income diversification, which is a process through which households develop a diverse portfolio of activities as a way of improving their standards of living and also managing risk (Ersado, 2003). Income diversification is an important aspect of livelihood diversification (and vice versa), which comprises capabilities, assets (economic and social) and activities that are necessary for achieving a means of living (Fabusoro et al., 2010). Following from this view, the theoretical framework of the analysis of income diversification can be studied within the sustainable livelihoods framework. This framework presents an economic relationship between assets, the activities in which households engage in using their assets, and the outcomes that result from these activities in terms of improving or deteriorating the welfare and well-being of the household (Freeman, Ellis and Allison, 2004). The framework places emphasis on access to and ownership of assets, which can be applied productively by the poor as a pathway out of poverty. The assets largely comprise land, livestock, human capital, farm implements, savings or access to credit, infrastructure (e.g. road or electricity) and social capital. This economic relationship is embedded in social and political relations as implied by the policy and institutional context.

Figure 3.2: A framework of analysis of sustainable livelihoods



Source: Modified version of Scoones (1998) and Freeman, Ellis and Allison (2004)
*The dotted lines represent areas that are beyond the scope of this chapter.

A commonly used definition of sustainable livelihoods has been provided by Chambers and Conway (1991, p. 6, paragraph 2), which states that:

> *A livelihood comprises the capabilities, assets (stores, resources, claims and access) and activities required for a means of living: a livelihood is sustainable if it can cope with and recover from stress and shocks, maintain or enhance its capabilities and assets, and provide sustainable livelihood opportunities for the*

next generation; and if it contributes net benefits to other livelihoods at the local and global levels and in the short and long term.

Following from Scoones (1998), the key question in the analysis of sustainable livelihoods is, given a particular setting, *what* combination of livelihood resources (assets) enable pursuance of *which* combination of livelihood strategies to achieve *what* outcomes? In this context, sustainable livelihoods are achieved through access to a range of capabilities, assets and activities, which lead to specific livelihood outcomes, such as increased household income and poverty reduction.

Within the context of millennium villages, the focus is on using the available assets and capabilities to pursue the available diversification strategies, which largely include: subsistence farming, commercial agriculture, farm employment, nonfarm wage employment and small-scale business and enterprise development (Figure 3.2). In this study, we focus on two key expected outcomes – increase in household income and poverty reduction. Other outcomes that are beyond the scope of this paper but are relevant in the context of sustainable livelihoods are those that focus largely on the sustainability dimension (including the resilience of livelihoods and the natural resource base).

3.3.2 Empirical evidence

This section is divided into two parts, with the first part looking at empirical evidence on the extent and determinants of diversification. The second part provides an overview of the empirical evidence on the impact of diversification on household income and poverty.

3.3.2.1 Extent and determinants of diversification

Experience has shown that households mostly derive their income from multiple sources and also hold their assets in more than one asset (Barrett and Reardon, 2000; Ellis, 2000). There are various reasons why households diversify their activities, income and assets, key among them: (i) to increase income for the household when income from the main activity is limited, (ii) to reduce income risks, (iii) to exploit strategic

complementarities and synergies between different activities and (iv) to realize economies of scope where the same inputs generate greater per unit profit when spread across multiple outputs (Barrett and Reardon, 2000; Babatunde and Qaim, 2010; Minot et al., 2006).

The decision by a household to diversify is determined by various factors that can generally be classified into two categories: push and pull factors. The main push factors include the need to reduce risks and smooth consumption (Barrett and Reardon, 2000; Barrett, Reardon and Webb, 2001) and the seasonal nature of farming, whereby households have to rely on nonfarm income during the dry seasons (Reardon 1997). Diversification is used as a risk management strategy due to a lack of social safety nets among many African households. De Janvry, Sadoulet and Zhu (2005) also argued that because of deficient rural credit and insurance markets in China, participation in nonfarm activities is the best alternative, as income from nonfarm activities could be used to increase investment in farm activities, mitigate income fluctuations and play the role of an insurance system. Bryceson (1996) argues that many African households were driven into economic diversification following implementation of structural adjustment programs in the '80s in a bid to minimize risk. Because of uncertain climatic conditions, rural farmers ventured into crop and plot diversification to minimize risk.

There are various socio-economic factors that have also been found to significantly determine the choice of livelihood strategies. Minot et al. (2006) found evidence of a positive and significant relationship between education of the household head and the degree of diversification. This is because education could enhance the chances of engaging in different activities through, for instance, enabling participation in wage employment and also facilitating the learning about new opportunities. The size and composition of the household also matter. Larger households with fewer dependents (children and elderly) tend to have more income sources as compared to smaller households. This is mainly due to the declining marginal productivity of additional farm labor as the household size increases, which makes venturing into alternative sources of income more attractive. Also, larger households are expected to have a diversified portfolio of skills and knowledge, which would allow the diversity of income sources at

the household level. The amount of labor within a household is also a strong factor in pushing households towards nonfarm activities, especially wage employment and non-agricultural self-employment (Winters et al., 2009). This is because rural households with greater labor endowments are likely to have higher labor-to-land ratios. Further, more labor is also associated with greater income gains from the nonfarm activities.

Availability of key factors of production, such as land, can be a key push factor for households to diversify. Research evidence (Minot et al., 2006; Winters et al., 2009) has shown that land availability is a key determinant of income diversification. Households with more farm size have been found to have a larger number of crops with more marketed surplus, but with less nonfarm income and income diversity. Similarly, Lanjouw and Lanjouw (2001) showed that larger household per capita landholdings reduced the probability of an individual engaging in the business sub-sector, which implied that large landowners were more likely to engage in agricultural activities than small landowners. However, they found that very large landholdings (of above 8.8 hectares) were associated with a higher probability of engaging in business activities. Lay and Schüler (2008) argued that both the total amount of land and land per adult equivalent should be considered while looking at the effect of land on diversification. This is because total land is an important asset that allows the household to overcome entry barriers into both farm and nonfarm activities. On the other hand, farm land per adult equivalent measures the ability of the household to adequately provide land and food to its members. It is expected that the likelihood of diversifying into the nonfarm sector increases with the size of land, while in contrast, households are likely to be pushed into nonfarm diversification with less land per adult equivalent.

It is argued that poorer households tend to have less access to nonfarm activities than better-off households and are therefore less diversified (Ersado, 2003; Shwarze and Zeller, 2005; Ellis, 2000; Abdulai and CroleRees, 2001). A review by Reardon (1997) based on 27 studies in Sub-Saharan Africa confirmed the argument that the share of nonfarm income in total income is greater among higher-income rural households in Africa, which is largely attributed to their higher skill levels and greater access to capital. Babatunde and Qaim (2010), using data from Nigerian households, also provide

evidence that diversification increases with overall household income, whereby richer households tend to have more diversified income sources than poorer households, who have a larger reliance on only farming. This is because poorer households are more likely to face entry barriers to higher-income earning activities, such as inadequate access to credit. Because of the entry barriers, activities with the highest potential tend to be concentrated among the middle and upper income classes (Rigg, 2006). Haggblade, Hazell and Reardon (2010) and Barrett, Bezuneh and Aboud (2001) also argue that wealthier households who are more endowed with productive assets are better able to take advantage of high productivity opportunities in the rural nonfarm economy than the poorer households. Thus, removal of economic and social barriers that limit the poor households' participation in the rural nonfarm economy should be addressed in order for the growth of the rural nonfarm economy to be pro-poor. Loison (2015), in her review on rural livelihood diversification in Sub-Saharan Africa, concluded that relatively better-off smallholders with sufficient assets achieved successful livelihood diversification mainly by exploiting opportunities and synergies between farm and nonfarm activities. Agyeman, Asuming-Brempong and Onumah (2014), in their study of the determinants of income diversification of farm households in the western region of Ghana, found that ownership of productive assets was a significant determinant of diversification.

Other studies such as Dercon and Krishnan (1996) argue that differences in portfolios, especially of high return activities, across households are largely explained by comparative advantage and constraints to entry into particular activities. They argue that the ability for households to diversify depends on access to means to diversify, such as skills, access to capital and credit. Limited access to credit restricts the ability of poorer households to invest in non-agricultural activities, thereby restricting them to agricultural activities and wage labor. Minot et al. (2006) support this argument by noting that diversification into high-value crops is mainly constrained by lack of credit and information about production and marketing, risk aversion and poor infrastructure. Such constraints can, however, be minimized through institutions that support vertical coordination, such as contract farming and farmers' associations. Shwarze and Zeller (2005), on the other hand, note that households diversify because returns to their assets

endowed in agricultural production decrease in relation to the returns from non-agricultural activities. This implies that the ability to diversify depends on access to the different types of assets.

Pull factors, on the other hand, are mainly associated with an increase in opportunities for diversification that are linked to: higher sources of income resulting from rural development, increased commercialization of agriculture, increased urbanization and better market access, etc. Babatunde and Qaim (2010) showed that while poor households could pursue distress-push diversification, there seemed to be a significant element of demand-pull diversification (Barrett and Reardon, 2000), which, for instance, could result from: (i) increasing household income, which provides the means to overcome investment entry barriers and also generates an increased demand for nonfarm goods and services; (ii) shifting from traditional goods and services to commercially-oriented farming and nonfarm activities as the rural economy develops, which stimulates diversification; and (iii) increased urbanization resulting from long-term population growth and density and infrastructural development, which could lead to the development of the nonfarm sector, thereby promoting diversification. Dercon and Krishnan (1996) also argue that differences in household portfolios can also be explained by access to public infrastructure such as marketplaces and roads and proximity to towns and common property resources.

Barrett, Bezuneh and Aboud (2001) underscore the importance of assessing the effect of policy shocks in shaping diversification decisions, given that diversification is important for enhancing household income and as a safety net. They argue that smallholder households must be able to overcome barriers (which include working capital, skills and market access) to participation in nonfarm activities that offer higher incomes. These barriers can be addressed through policy change, although failure to recognize the barriers to entry during policy reform can undermine the poor households' ability to benefit from the activities that arise as a result of the policy change. These authors showed that in Cote D'Ivoire, households that were less endowed with assets were less able to take advantage of emerging and attractive farm and nonfarm opportunities that arose following the exchange rate reform. In Kenya, they showed that households that

benefitted from the food-for-work transfers encountered less liquidity constraints, which enabled them to diversify into higher return agricultural production and nonfarm activities. Thus, interventions must explicitly address poor households' constraints in terms of working capital, skills and market access in order for them to be able to pursue superior livelihood strategies and escape poverty traps.

3.3.2.2 Effect of diversification on household income and poverty

There exists empirical evidence showing that diversification leads to higher household income and reduces the likelihood of being poor. Freeman, Ellis and Allison (2004) used data from rural Kenya to show that households that relied heavily on agriculture were poorer than those that combined food crop agriculture with livestock keeping and engagement in nonfarm activities. They provided evidence that rural poverty reduction efforts require a broader focus that encourages and facilitates diversity and mobility. Ellis, Kutengule and Nyasulu (2003) also argue that securing a better living standard for rural households in Malawi requires an ability to accumulate assets and to diversify sources of income into both farm and nonfarm activities. They argue that rural poverty in Malawi can only be tackled through a combination of raising agricultural productivity, diversifying farm output to reduce risk, shifting towards higher value crops and diversifying into nonfarm activities. Awotide, Kehinde and Agbola (2010) also showed that engagement in a diversified livelihood portfolio reduced the risk of being poor among Nigerian households, while Bigsten and Tengstam (2008) showed that rural households in Zambia who participated in nonfarm activities had a higher level of income as compared to those who participated in farming alone.

Ellis and Bahiigwa (2003) and Ellis and Mdoe (2003) also lend support to the argument that less reliance on agriculture is important for poverty reduction and that those households that rely on more diversified sources of livelihood are less likely to be poor. Further, rural poverty is also strongly associated with the lack of productive assets and the inability to access nonfarm activities. They show that poorer households in Uganda and Tanzania largely depended on food crop agriculture, seasonal wage income and remittances for their livelihoods, while better-off households relied on food crop agriculture, livestock and nonfarm self-employment activities. Ellis and Mdoe (2003)

show that nonfarm income accounted for 11 percent of total income in the bottom quartile, while it accounted for 44 percent in the top quartile in Tanzania. In addition to the important role played by the nonfarm economy, the rural poor also require an enabling institutional framework in order to construct pathways out of poverty.

De Janvry, Sadoulet and Zhu (2005) provide evidence that not only did households who participated in nonfarm activities in rural China have higher incomes than those that participated only in farming, they also absorbed a large quantity of surplus rural labor and improved their standards of living. Further, participation in nonfarm activities notably reduced rural poverty, in addition to reducing the depth and severity of poverty by narrowing the income gap among rural poor households and improving the income of the poorest households. De Janvry, Sadoulet and Zhu (2005) estimated that about 87 percent of the decline in poverty between 1980 and 1995 in rural China could be attributed to participation in nonfarm activities, while farm activities accounted for only 13 percent of the reduction in poverty.

Mat, Jalil and Harun (2012) show that nonfarm income reduced the level, depth and severity of poverty in Kedah (Malaysia). Their results show that the poverty headcount for households that derived their income from both farming and nonfarm income declined by 42.94 percent as compared to a decline of only 14.72 percent for households that relied on farm income and remittances. In addition, the poverty gap for households that derived their income from both farming and nonfarm income declined by 55.71 percent as compared to a decline of only 23.35 percent for households that relied on farm income and remittances.

Karugia et al. (2006) support the argument that integration of farm and nonfarm investments is required to enable households to generate sufficient incomes to escape poverty in rural Kenya. This is because after initial investments in farming, expected returns to land investments decline, especially with declining land sizes, which calls for investments into the nonfarm economy. They also support the argument that households that rely heavily on food crop production and seasonal wage labor activities are more vulnerable and poorer than households that have better access to productive

assets (such as land and human capital) and use their assets to engage in diverse livelihood strategies that are less risky and offer higher returns.

Evans and Ngau (1991) show that while poor households in rural Kenya relied only on subsistence farming as a single source of income, richer households relied on multiple sources of income, including farming, wage income and nonfarm activities. They found that while only 18 percent of poorer households earned income from nonfarm activities, 67 percent of richer households earned income from nonfarm activities and were therefore more diversified than poorer households. In addition, richer households tended to have more liquid assets than poorer households. They argue that narrow sectoral approaches aimed at raising agricultural productivity are less effective in reducing poverty and due attention should be paid to the role of the nonfarm activities, especially small scale businesses and nonfarm employment opportunities. Thus, agricultural sector development programs should be part of a broad development strategy that encompasses both the farm and nonfarm sectors. Riggs (2006) further supports this argument by arguing that the best means of promoting pro-poor growth in rural areas has very little to do with supporting smallholder farming but should focus more on endowing poor people with skills that can help them move out of farming. There is a need for smallholder farmers to move beyond peasantry to being agrarian entrepreneurs who are commercially oriented towards the demands of the market.

Haggblade, Hazell and Reardon (2010) argue that nonfarm incomes play an important role as a safety net by preventing households from falling further into poverty, especially during crisis. They argue that the rural nonfarm economy can play an important role in reducing poverty, but only in regions that have a strong rural economic base or adequate access to growing urban economies. The rural nonfarm economy will contribute to poverty reduction only if it leads to an increase in income, which can be achieved through investment in productive capacity and productivity of rural tradable goods that ensures competitiveness in external markets. Within a favorable policy environment, increasing agricultural output and productivity is expected to spur growth of nonfarm business development, which will lead to an increase in nonfarm incomes and investment.

There is also research evidence that shows that diversifying into nonfarm activities enhances agricultural productivity, thereby increasing household income. Freeman, Ellis and Allison (2004) argue that income from nonfarm activities boosts agricultural production by financing access to inputs, which enables poor households to escape poverty. Babatunde (2015), in his study on the impact of nonfarm income on agricultural production and efficiency in the Nigerian state of Kwara, also found that nonfarm income contributed to higher farm production and larger expenditure on purchased inputs, while it decreased the use of family labor. Evans and Ngau (1991) also argue that nonfarm income enables farmers to become more productive, which leads to an increase in household income. Agricultural productivity can be enhanced by spending more money on purchases of farm inputs required for production. They showed that richer households invested in production inputs (such as hired labor, agrochemicals and equipment) five times more than poorer households.

3.4 Methodology

This section provides an overview of the method of analysis. The section is sub-divided into three sections. Section 3.4.1 discusses the methods that were used to derive the diversification indices. Section 3.4.2 outlines the methods that were used to examine the factors that affect the level of diversification at the household level. Section 3.4.3 discusses the methods for estimating the impact of diversification on household income and poverty. Lastly, section 3.4.4 discusses the methods for assessing the impact of diversification on MVP income effects.

3.4.1 Measuring the degree of diversification

There are various methods that have been applied in the literature to measure the degree of concentration or diversification. We apply two types of diversification measures to assess whether our results are sensitive to the choice of the diversification measure.

The first measure is the Simpson Index of Diversity (SID) as applied by Joshi et al. (2003). SID measures the degree of diversity and ranges from 0 to 1, where movement towards zero indicates complete specialization, while movement towards 1 indicates a higher degree of diversification. SID is computed as follows:

$$SID = 1 - \sum_{i=1}^{n} P_i^2$$

where n can be interpreted as the number of income sources and P_i is the proportionate value of i^{th} activity in the total income.

A second measure of diversification is the Shannon-Weaver Index (SWI). Following from Minot et al. (2006) and Shwarze and Zeller (2005), we define SWI as follows:

$$SWI = -\sum_{i}^{n} P_i \ln(P_i)$$

where n can be interpreted as number of income sources and P_i is the proportionate value of i^{th} activity in the total income. The index increases with diversity. The SWI has been found to be less sensitive to the degree of dominance of the largest categories than the SID (Minot et al., 2006).

3.4.2 Determinants of income diversification

The analytical framework of the model is based on a standard rural household model of the determinants of income diversification, which follows from Escobal (2001). The household seeks to maximize its utility subject to several constraints, including: (i) cash constraints, (ii) production technologies, (iii) prices, (iv) an equilibrium condition for self-sufficiency of farm production and (v) an equilibrium condition for family labor. Labor allocation between farm and nonfarm sectors is determined using the first order conditions of the maximization problem through the factor supply and demand functions. The reduced form of the model is given as:

$$Z_{ij} = f(X)$$

where Z_{ij} represents income shares from farm and nonfarm sectors and X represents factors affecting income diversification such as input and output prices and asset holdings, e.g. human capital, financial assets, farm fixed assets, etc.

A tobit model, which is mainly used for censored data, is used to assess the determinants of diversification (as applied in Shwarze and Zeller, 2005 and Minot et al., 2006). The dependent variables are diversity indices, while the independent variables are as defined in Table 3.1. We estimate separate equations for the total sample and millennium villages. We do not estimate separate equations for the control group because the sample size of those with above average diversity is very small. The a priori expectations on the direction of causality are indicated in the last column, which shows whether the expected coefficient (α) is positive or negative. The expectations are mainly guided by previous empirical evidence as discussed in the literature.

Table 3.1: Definition and measurement of variables

Variable	Type and definition	Measurement	A priori expectation
Dependent variables			
Diversity index	SID censored between 0 and 1; SWI censored above 0. Both are degrees of diversification of household income	Derived using SID and SWI as discussed in part (a) above	
Total income	Discrete, total amount of cash income for the household	Amount in Kenya shillings (KES)	
Poverty	Dummy variable, poverty status of household	1 for poor, 0 for non-poor: based on rural poverty line of 1562 KES of monthly household expenditure	

MVP income effects	Discrete, effect of MVP on cash income for the household	Computed as the difference between the income of a household and its counterfactual (as estimated in Chapter 2)	
Independent variables			
MVP	A dummy variable, participation in MVP	1 for MVP, 0 for control group	$\alpha>0$, households within millennium villages are more diversified
Sex of the household head	A dummy variable, sex of household head	1 if male, 0 if female	$\alpha<0$ or $\alpha>0$, effect is indeterminate
Age of the household head	Discrete, age of household head	Number of years of completed	$\alpha<0$, or $\alpha>0$, effect is indeterminate
Marital status of household head	Dummy variable, Marital status of household head	1 for married household heads, 0 for single (never married, divorced, widowed) household heads	$\alpha>0$, married household heads tend to be more diversified
Education of the household head	Discrete, number of years of schooling by the household head	Number of years of schooling by the household head	$\alpha>0$, the higher the coefficient of the education variable, the higher the diversity index
Household size	Discrete, number of members in a household	Number of household members	$\alpha>0$, the larger the household, the higher the diversity index

Dependency	Discrete, level of dependence within household	Derived by taking the ratio of economically inactive over active members of the household	α>0, the higher the dependency, the higher the diversity index
Type of house	Dummy variable, type of house	An indicator of wealth status, 1 is temporary, 0 is semi-permanent and permanent house	α<0, those with temporary houses are expected to have lower diversity indices
Land size	Discrete, size of land holding	The size of land owned by household in hectares	α<0, the larger the land size, the lower the diversity index
Credit	Dummy variable, access to formal credit	1 for access to formal credit, 0 for access to informal sources of credit	α>0, the more access to formal credit, the higher the diversity index
Investment type	Dummy variable, type of investment over the past three years	1 for investment in agriculture and farm-related activities, 0 for investment in nonfarm activities, e.g. small scale businesses	α<0, the more investment in agriculture and related activities, the lower the diversity index

3.4.3 Assessing the effect of diversification on household income and poverty

In this section, we assess whether households that diversified more in nonfarm activities had higher household incomes and lower poverty levels. Consider a linear model that relates household income (the dependent variable *Z*) to the level of diversification and other exogenous variables (the *x*) as follows:

$$Z = \alpha_0 + \alpha_1 x_1 + \alpha_2 x_2 + \cdots + \alpha_n x_n + \mu$$

where μ is the random error term and is assumed to be independent and identically distributed, with a normal distribution where:

$E(\mu) = 0 \qquad \text{Var}(\mu) = \delta^2 \qquad Cov(x_n) = 0$

As shown in figure 3.1, household income and diversification have a bi-directional relationship, implying that the level of diversification is endogenous. Estimation of equation (i) by ordinary least squares would lead to inconsistent estimators because $\text{Cov}(x_n) \neq 0$ (Wooldridge, 2010). The solution is to use instrumental variable (IV) estimation. To use the IV approach, we need a variable V that is not part of x and satisfies two conditions: (i) it must be uncorrelated with the error term μ i.e $Cov(V, \mu) = 0$ and (ii) the variable must be partially correlated with the endogenous variable.

Given the difficulty in fulfilling the exclusion restrictions, we instead estimate reduced form relationships and test for common causality in the determinants of diversification, household income and poverty as applied in Walle and Cratty (2004). Common causality is identified by exogenous explanatory variables having the same sign in regressions for diversification, household income and poverty. A trade-off is indicated by opposing signs. Even though this approach does not answer the question of whether diversification enhances household income and reduces poverty, the method sheds light on whether diversification, household income and poverty are explained by the same covariates. We therefore estimate the income equation using OLS and the poverty equation using probit, with the same covariates as those applied in section 3.4.2.

The derivation of poverty indices follows Foster, Greer and Thorbeck (1984). Let $y = (y_1, y_2, \ldots\ldots\ldots, y_n)$ be a vector of household incomes in increasing order, and suppose $W > 0$ is a predetermined poverty line. In addition, the income shortfall of the i^{th} household is $g_i = W - y_i$; the number of households with income below the poverty line is given by $q = q(y; w)$ and the total number of households is given by $n = n(y)$. The poverty measure of the households will be defined as:

$P(y; w) = \frac{1}{nw^2} \sum_{i=1}^{q} g_i^2$

3.4.4 Assessing the effect of diversification on MVP income effect

The question is whether those who diversified benefited more from the MVP by deriving higher income treatment effects. Following from Chapter 2, we estimate the impact of the MVP on household income measures (observed and counterfactual) for both regimes 0 and 1 as discussed in Chapter 2 using propensity score matching. Suppose the treatment status is denoted by T, which implies that T_i = 1 if household *i* participates in the MVP program and T_i = 0 if the household does not participate in the program (the counterfactual, represented by the control group). Recall that the potential outcomes are Y_i^T for the income of a household participating in the program and Y_i^C for the counterfactual. The change in income gain of the program is given by $\Delta Y = Y_i^T - Y_i^C$. The Average Treatment Effect on the Treated (ATET), which is the mean impact on household income among those households participating in the program, is as derived in chapter two and given by:

$$ATET = E(\Delta Y|T = 1) = E(Y_i^{T=1}\big|T = 1) - E(Y_i^{T=0}|T = 0)$$

Thus,

$$ATET = \frac{1}{n}\sum_{i=1}^{n}\left[Y_i^{i\epsilon T=1} - Y_i^{i\epsilon T=0}\right]$$

We then estimate an equation using ATET as the dependent variable and the level of diversity as one of the independent variables, for regime 0 and 1. The other dependent variables are as defined in section 3.4.2. We tested for endogeneity to determine whether to apply the Ordinary Least Squares or instrumental variable estimation techniques.

The next stage of the analysis follows from De Janvry, Sadoulet and Zhu, (2005), whereby, using the regression results as derived above, we estimate the expected MVP income effects for two different levels of diversification. We identify two separate regimes: regime 0 for households with below average diversity indices (i.e. SID ≤ 0.5) and regime 1 for households with above average diversity indices (i.e. SID >0.5). To assess the effect of diversification, we (a) first estimate household MVP income effects

equations from observed values for each regime, (b) use the equations to predict expected MVP income effects for households in regimes 0 and 1 and (c) compare the predicted and observed MVP income effects. To predict the MVP income effects, for instance for regime 0, the MVP income effect for regime 0 would be their observed MVP income effect, while the income effect for regime 1 would be the predicted income effect that they would derive if they were not participating in nonfarm activities. Average observed and predicted household MVP income effects are summarized as shown in Table 3.2.

The hypothesis is that households with higher levels of diversity would have higher/lower MVP income effects as compared to those with lower diversity indices, i.e.

H_0: $ATET_{regime\ 0} = ATET_{regime\ 1}$

H_a: $ATET_{regime\ 0} \neq ATET_{regime\ 1}$

Table 3.2: Average observed and simulated household income and poverty

	Regime 0: Households with lower diversity index ($P_i = 0$)	Regime 1: Households with higher diversity index ($P_i = 1$)
Regime 0: Households with lower diversity index ($P_i = 0$)	$y_0^a \mid p = 0$, observed MVP income effect	$\hat{E}y_1^a \mid p = 0$, expected MVP income effect
Regime 1: Households with higher diversity index ($P_i = 1$)	$\hat{E}y_0^a \mid p = 1$, expected MVP income effect	$y_1^a \mid p = 1$, observed MVP income effect

3.5 Research Findings

3.5.1 Descriptive statistics

The test of significance of the difference in means for the total sample and the millennium villages all show that there are significant differences between households

that are less diversified and those that have higher levels of diversification (Table 3.3). The diversity indices (both SID and SWI) are significantly different between the two groups. Other differences are with regard to the household size, dependency ratios, size of land and poverty status of the household. We also carried out a difference in means test for the level of diversification between the millennium villages and the control villages. We found that the differences between the millennium villages and control villages were insignificant.

Table 3.3: Summary of test of significance of the difference of means

	Total sample				**Millennium villages**			
	Regime 0	Regime 1	Total	Difference in means (regime 1-regime 0)	Regime 0	Regime 1	Total	Difference in means (regime 1-regime 0)
Sex of household head	0.71	0.72	0.71	0.06	0.72	0.72	0.72	0.05
Age of household head	51.7	50.3	51.5	-1.39	53.2	50.7	52.7	-2.5-
Marital status	0.67	0.71	0.67	0.04	0.69	0.74	0.70	0.05
Education of household head	8.0	8.9	8.2	0.83	8.6	9.2	8.7	0.56
Household size	5.2	6.5	5.4	1.29*	5.6	7.1	5.8	1.5*
Dependency ratio	0.76	1.21	0.83	0.44*	0.85	1.21	0.92	0.35**
Type of house	0.24	0.2	0.23	-0.04	0.17	0.19	0.17	0.02
Land size	0.49	0.42	0.48	-0.07	0.57	0.39	0.53	-0.18**
Access to credit	0.11	0.05	0.11	-0.07	0.16	0.07	0.14	-0.94
Type of investments	0.48	0.47	0.48	0.02	0.51	0.44	0.50	-0.72
Total income	4305.4	4622.5	4351.6	317.13	4752	4,863.8	4,709	111
Poverty status	0.27	0.15	0.25	0.12**	0.18	0.12	0.17	-0.06
Simpson Index of Diversity	0.22	0.61	0.26	-0.25*	0.21	0.61	0.29	0.40*
Shannon-Weaver Index	0.32	0.93	0.41	0.60*	0.33	0.94	0.44	0.62*

Source: Author's own computation from original survey data (2009)

* and ** stand for significance at 1 percent and 5 percent significance levels, respectively.

From the summary statistics, households that have higher levels of diversity have larger household sizes, higher dependency and smaller land sizes. There is also a significant difference in poverty status (but only for the total sample) between households that have

lower levels of diversity and more diversified households. The difference in household income is not significant. While we can deduce that the level of diversity is influenced by the household size, level of dependency and land size, more analysis is carried out in section 3.5.2 to determine the magnitude of the effects.

3.5.2 Determinants of diversification

The tobit model for the determinants of diversification was estimated for the total sample and for millennium villages using both indicators of diversification. The results are shown in Table 3.4. For the total sample, the estimation results using both SID and SWI indicate that household size, level of dependency and land size were the main drivers of diversification.

For the MVP sample, an increase in household size by one member increases the expected value of SID by 0.029 and SWI by 0.054. For the total sample, an increase in household size by one member increases the expected value of SID by 0.021 and SWI by 0.038. Similarly, households with higher dependency ratios were found to diversify more than households with fewer dependents for the total sample. An increase in the level of dependency by one member increases the expected value of SID by 0.059 and SWI by 0.077.

The size of land was also found to be a significant determinant of diversification, with an inverse relationship between land size and diversification. This shows evidence of land being an important push factor into diversification, whereby households with smaller parcels of land are forced to look for alternative nonfarm means of generating additional income. Increasing the size of land by one hectare reduces the expected SID by 0.075 and expected SWI by 0.139 for millennium villages. Similarly, it reduces expected SID and SWI by 0.089 and 0.150, respectively, for the total sample.

The MVP dummy was insignificant for both SID and SWI. This shows that the level of diversification was not significantly different between the millennium villages and the control villages. Thus, we can deduce that the MVP did not succeed in enhancing diversification in the millennium villages.

Table 3.4: Determinants of diversification

	MVP		Total sample	
	SID	SWI	SID	SWI
MVP dummy			-0.024	-0.024
Sex of household head	-0.064	-0.123	-0.021	-0.053
Age of household head	0.001	0.001	0.001	0.002
Number of years of education	0.007	0.020	-0.001	0.002
Household size	0.029*	0.054*	0.021**	0.038*
Marital status	0.059	0.121	0.080	0.145
Dependency	0.053	0.060	0.059**	0.077***
Size of land	-0.075***	-0.139***	-0.089**	-0.150**
Access to formal credit	0.023	0.031	-0.034	-0.059
Land ownership	0.083	0.120	0.061	0.093
Type of house	-0.046	-0.055	-0.026	-0.036
Type of investment	-0.027	-0.078	-0.015	-0.066
Amount of investment	-0.000	-0.000	0.000	0.000
Constant	0.096	0.033	0.127	0.144
Number of observations	133	134	221	222
LR chi2(12)	22.780	24.860	24.400	28.860
Prob > chi2	0.030	0.016	0.028	0.013
Pseudo R2	0.1931	0.114	0.130	0.078

Source: Author's own computation from original survey data (2009)

*, ** and *** stand for significance at 1 percent, 5 percent and 10 percent significance levels, respectively.

3.5.3 Impact of diversification on household income and poverty

The regression results for the income and poverty equations (with similar covariates as those in the equation on the determinants of diversification) are shown in Table 3.5. For the MVP sample, income is significantly determined by sex of the household head, number of years of education, marital status, dependency, whether the household head has access to formal credit and type of house (as an indicator of wealth status). The

results show that female-headed households have a lower mean income than male-headed households by KES 1,633.6. Increasing the number of years of education by 1 year increases household income by KES 319.2. Married household heads also have higher household income, estimated at KES 1,801.4, which is most likely due to the higher likelihood of having more than one income earner. Dependency negatively affects income, whereby increasing the number of dependents by one reduces income by KES 582.2. Comparing the effect of having more dependents on diversification to its effect on household income, we see a trade-off effect (as the variable has opposing signs in the estimations). Access to formal credit also increases household income by KES 1,947.7. As for the type of house, wealthier households (with permanent houses) have higher incomes of about KES 2,138.4.

The probability of being poor is explained by the household size and the size of land. Increasing the household size by one member increases the probability of being poor by 0.036. This relationship is similar to that in the determinants of diversification, thus indicating common causality. However, increasing the size of land by one hectare reduces the probability of being poor by 0.259. This variable also shows common causality, as households with larger land sizes diversified less. These findings corroborate the earlier findings in Chapter 1, which revealed that large household sizes and smaller land sizes undermined the translation of increased agricultural productivity into higher household incomes.

For the total sample, we find that the MVP dummy for both the income and poverty equations is insignificant, which implies that there were no significant differences in income and poverty between the millennium villages and the control villages. This finding is in line (i.e. also shows common causality) with the findings in section 3.5.2, which also showed that there were no significant differences in the level of diversification between the millennium villages and control villages. We can thus deduce that the MVP did not significantly enhance diversification and household income, which corroborates our findings in Chapter 2 regarding the insignificant cash income effect.

Table 3.5: Determinants of household income and poverty

	MVP		Total sample	
	Total income	Poverty (probit marginal effects)	Total income	Poverty (probit marginal effects)
MVP dummy			-579.0	0.017
Sex of household head	-1,633.6***	0.028	-936.0	0.073
Age of household head	-25.2	0.000	-17.8	0.002
Number of years of education	319.2*	-0.018	1,387.1**	-0.021**
Household size	177.7	0.036***	257.6	0.015
Marital status	1,801.4**	-0.136	159.8**	-0.083
Dependency	-582.2***	0.052	-137.0	0.076***
Size of land	772.1	-0.259**	1,898.8***	-0.015
Access to formal credit	1,947.7**		1,137.2	
Land ownership	-535.7	0.121	-621.3	0.065
Type of house	-2,138.4*	-0.062	-1,129.7**	-0.060
Type of investment	-255.7	-0.110	198.9	-0.221**
Amount of investment	0.0	-0.000	0.1*	-0.000***
Constant	6,441.3*		3,214.5	
Number of observations	134	115	222	194
F statistic	8.5		80.6	
Prob>F	0.0		0.0	
R squared	0.5		0.8	
Root MSE	2,836.4			
Wald chi2		20.61		28.06
Prob > chi2		0.038		0.005
Pseudo R2		0.14		0.125

Source: Author's own computation from original survey data (2009)

*, ** and *** stand for significance at 1 percent, 5 percent and 10 percent significance levels, respectively.

Other factors that explain variations in household income for the total sample are number of years of education, marital status, size of land, type of house (wealth status) and amount of investment. The probability of being poor is explained by education, the level of dependency, type of investment and amount invested. Increasing the level of education by one year reduces the probability of being poor by 0.021, while increasing the number of dependents by one increases the probability of being poor by 0.076. Investing in agriculture and farm-related activities reduces the likelihood of being poor by 0.221, while higher amounts of investment reduce the likelihood of being poor but by a very small margin.

3.5.4 Impact of diversification on MVP income effect

An important aspect of this study was to assess the impact of diversification on the MVP's household income effect. The question was whether enhanced diversification would have led to higher household income and consequently higher MVP income effects. The results are shown in Table 3.8.

Table 3.8: Average observed and simulated MVP effects on household income

	Regime 0: Households with lower diversity index (P_i = 0)	Regime 1: Households with higher diversity index (P_i = 1)
Regime 0: Households with lower diversity index (P_i = 0)	$y_0^a \mid p = 0$, observed income effect **383**	$\hat{E} y_1^a \mid p = 0$, simulated income effect **357.2**
Regime 1: Households with higher diversity index (P_i = 1)	$\hat{E} y_0^a \mid p = 1$, simulated income effect **-4,085.6**	$y_1^a \mid p = 1$, observed income effect **-4085.6**

Source: Author's own computation from original survey data (2009)

From this analysis, we can deduce that:

i. Higher levels of diversification would have led to lower MVP income effects for the households within the millennium villages, from 383 KES to 357.2 KES. This

reduction in income effects following increased diversification is an indication of the MVP's focus on interventions in agriculture as opposed to intensification of diversification of activities. Even though the MVP advocated for diversification, our statistics reveal that the average diversity index was very low (0.29 for millennium villages and 0.26 for the total sample). Further, the tests of the difference in means also reveal that the difference in mean SID between the millennium villages and the control villages was insignificant.

ii. Households that had higher levels of diversity would have had no change in average income effects (but differences in minimum and maximum expected income values) if they had increased their reliance on farming. This is also explained by their land size constraints, which would have hindered them from benefiting from MVP's agricultural interventions.

3.6 Discussion

There is evidence from literature that has shown that most rural households diversify their sources of income (Barrett and Reardon, 2000). For Sauri millennium village and the control households, the level of diversification was relatively low, with an average SID of 0.29 for millennium villages and 0.25 for the control group (considering that 0 represents no diversification and 1 represents the highest level of diversification). We also found that the difference in means between the millennium villages and control group was not significant.

There are various factors that drove households to diversify their activities. Among the key push factors for diversification was the size of land. Our results further corroborate earlier findings of an inverse relationship between land size and participation in the nonfarm economy (Minot et al., 2006; Winters et al., 2009). Households with smaller pieces of land have to look for alternative sources of income to supplement their farm income, while those with large farms tend to have a larger number of crops with more marketed surplus, but with less nonfarm income and income diversity. Statistics from our data show that about 70 percent of the households in Sauri owned an average of 0.5

hectares of land. With the small pieces of land, our findings echo the arguments by Nziguheba et al. (2010) that households are unlikely to escape the poverty trap by practicing small-scale subsistence agriculture on a 0.5 hectare piece of land regardless of the level of agricultural productivity. Thus, diversification into the nonfarm economy is the key to escaping the poverty trap in Sauri.

Our findings also reveal that smaller households with fewer dependents have a higher probability of participating in farm activities. But large households would require a diversity of activities to meet the household demands. Larger households could also imply more abundant labor, which has largely been associated with greater income gains from the nonfarm activities (Winters, 2009). As discussed in the previous chapter, larger households greatly undermined the transmission mechanism between increased agricultural productivity and income, given that a bigger proportion of output was allocated to self-consumption, leaving a smaller proportion to be sold as surplus to generate income. For Sauri, the combined effect of large household sizes and higher dependency are an indication of the need for a more diversified portfolio for higher household income.

Our findings also reveal that there were no significant differences in the level of income and poverty between the millennium villages and the control villages. The insignificant effect on income and poverty could partly be explained by the insignificant effect of the MVP on the level of diversification. The factors that were found to significantly affect the level of diversification, household income and poverty were household size, dependency and the size of land. This finding is supported widely in literature, where proponents of diversification argue that diversification into the nonfarm economy is important in enhancing household incomes and providing a pathway out of poverty (Ellis, Kutengule and Nyasulu, 2003; Ellis and Bahiigwa, 2003; Ellis and Mdoe, 2003; De Janvry, Sadoulet and Zhu, 2005). There is also evidence showing that most poor households in Africa rely largely on subsistence farming and lack productive assets that can enable them to venture into nonfarm activities (Ellis and Bahiigwa, 2003; Ellis and Mdoe, 2003; Karugia et al., 2006; Evans and Ngau, 1991).

Further findings also revealed that the effects of the MVP interventions on income were less for the households that had higher levels of diversity. These findings are largely an indication of the MVP's major emphasis on agricultural interventions, despite having advocated for diversification to enhance household income and reduce poverty levels. Even though the level of diversity was significantly higher in the millennium villages as compared to the control villages, the level of diversity on average was too low to enable significant income gains. Taking note of the low levels of diversification among Sauri households, we can therefore partly attribute the insignificant MVP income effect to the insufficient diversification of activities.

These results point to the importance of emphasizing a broad-based rural development strategy that not only seeks to raise agricultural productivity but also promotes diversification of farm output, enhances commercialization and promotes diversification into the nonfarm economy. We have also shown that the design of interventions should have a clear evaluation of local level characteristics that might undermine the effectiveness of the interventions. In this case, land size and household size have been shown to be significant determinants of (i) the translation of increased agricultural productivity into higher household incomes (as shown in Chapter 1) and (ii) the level of diversification of a household. Thus, we also conclude that testing of assumptions and mechanisms in the theory of change are important to ensure the effectiveness of the interventions.

Lastly, we take note of the limitations of the study approach. One key limitation is that the study analyzed partial effects of diversification on household income and poverty. We take note of the presence of important feedback effects of poverty and household income on diversification. Thus, an area for further research would be to examine the effect of poverty and household income on diversification and also to assess general equilibrium effects of the impact of diversification on household income and poverty.

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Chapter 4: Institutional Change and Effectiveness of Rural Development Interventions

4.1 Introduction

Over time, rural development initiatives that are aimed at poverty reduction have not only focused on the role of agriculture and the nonfarm economy, but also recognized the important role played by institutions in shaping rural livelihood outcomes (Rodrik, 2004; De Laiglesia, 2006). The compounding role of institutions is necessitated by the multidimensional nature of poverty, which calls for holistic solutions that address the symptoms and causes of poverty (IFAD, 2009). One of the ways through which institutions affect the performance of the economy is through their effect on the cost of exchange (transaction costs) and production (North, 1990; Eaton and Meijerink, 2007; Dorward et al., 2009). High transaction costs lead to market failure, which further increases the risks and the costs of exchange. Further, all social interaction in which people exchange resources, information and services and implement activities is embedded in institutions, which determine the distribution of power and access to and control over resources and services (Bastiaensen, De Herdt and Vaessen, 2002). Thus, developing rural institutions that are responsive to the needs of the poor is a "crucial question for economic policy-making as governments try to accelerate rural development and poverty reduction in economies that are increasingly market-based" (IFAD, 2003a, p.4). Improving market access is of importance to all rural households, "and assisting rural poor people in improving their access to markets must be a critical element of any strategy to enable them to enhance their food security and increase their incomes" (IFAD, 2003b, p.5).

It is evident that the Millennium Villages Project (MVP) underscored the importance of efficient markets in meeting the desired goals of increasing agricultural productivity and

boosting household income. To enable households to pursue these livelihood strategies, the MVP emphasized the role of market institutions in both implementation and sustainability of the investments (Sanchez et al., 2007). In the MVP concept note (see MVP, 2008 and Millennium Promise, 2010), it is noted that effective institutions are necessary to facilitate the implementation and sustainability of the investments. It is stated that:

> *Rural development requires community-based investments in priority sectors including agriculture, health, education, water, transport infrastructure, energy services, and the environment, and effective institutions at the community-level capable of implementing and sustaining these investments* (MVP, 2008, p.55; Millennium Promise, 2010, p.9).

Another report by Millennium Promise underscores the importance of enhancing access to markets if the poor are to escape from extreme poverty. They state that:

> *The core idea is that impoverished villages, in partnership with donors, can escape from extreme poverty if they are empowered with proven and powerful technologies to improve their farm productivity, health, education, and access to markets* (Millennium Promise, 2005, p.2).

UN Millennium Project (2005) also observes that marketing of agricultural produce is vital for creation of the linkage between increased agricultural productivity and household income. They also emphasize the importance of networks with agro dealers, provision of storage facilities and enhancing access to credit. They state that:

> *To further improve farmers' ability to market their products and access markets, national strategies can focus on building storage facilities, encouraging networks of agro dealers, and improving credit and savings facilities. All these investments will succeed when smallholder farmers and rural communities are empowered to establish their own institutions — for example, farmer field schools to gain access to new agricultural technologies, village banks to gain access to financial services, and farmers' associations to negotiate with market intermediaries* (UN Millennium Project, 2005, p.71).

There are various definitions of institutions in literature, key among them North (1990), who defines institutions as the rules of the game in a society or, more formally, the humanly devised constraints that shape human interaction. These institutions include both formal and informal constraints and are either created or evolve over time. Lin and Nugent (1995) define institutions as a set of humanly devised behavioral rules that govern and shape the interactions of human beings, in part by helping them to form expectations of what other people will do. “Institutional arrangement” is used interchangeably with institutions, while "institutional change" refers to a change from one institutional arrangement to another.

Given that agriculture is a key source of livelihood for the majority of people in rural Africa, effective institutions are a *sine qua non* for agricultural growth (Eicher, 1999). Well-functioning agricultural markets, in particular, are essential for rural growth and poverty reduction. However, markets for inputs (seeds and fertilizer) in Africa have been shown to be inefficient, with demand for inputs being seasonal and weaker due to the possibility of farmers growing varieties whose seed can be saved from the harvest and replanted for several cropping seasons (World Bank, 2007). The access to output markets is also limited, which has been viewed as an impediment to households’ attempts at increasing their standards of living (IFAD, 2001). Most rural households have limited connection with markets, with only between one- and two-fifths of the rural population being significant participants in agricultural markets (IFAD, 2010). For the smallholder farmers to escape poverty, they need to gain access to remunerative and reliable produce markets that can enable them to commercialize their production systems and increase their farm incomes. Lastly, financial constraints are also pervasive in African agriculture, with the financial contracts in rural areas involving higher transaction costs and risks than those in urban settings (World Bank, 2007). This is because of the greater spatial dispersion of production, lower population densities, lower quality of infrastructure and the seasonality and often high covariance of rural production activities.

It has been argued that the effectiveness of agricultural interventions for rural development has been largely undermined by the misconception and misinterpretation

of farmer behavior and inadequate consideration of the role played by institutions when designing rural interventions (Roumasset, 2004; Bastiaensen, De Herdt and Vaessen, 2002). Meinzen-Dick, Di Gregorio and McCarthy (2004) also support this view by emphasizing the importance of small-scale community collective action either through indigenous institutions or external programs in explaining the failures of earlier community-based development programs. Thus, maximizing the poverty reducing effects of rural development interventions requires an in-depth understanding of key local institutional features, which were also relevant for the MVP (Christiaensen, Demery and Kühl, 2006; FAO, 2011; Eaton and Meijerink, 2007).

Institutions tend to be well-defined to perform specialized functions, which implies that traditional institutions may no longer be optimal as the structure of the economy changes (Lin and Nugent, 1995). Institutional change is necessary for development to occur, as institutions could become obstacles to development over time (Ruttan, 1985). But institutional rigidity and inertia may limit the efficient evolution of institutions, which implies that the institutions will not always be efficient. Dysfunctional institutions may persist because of distributive conflicts and asymmetries in bargaining power among social groups (Bardhan, 2005) or due to the importance of existing path-dependent processes, which makes some arrangements non-viable because of incompatibility with other existing arrangements in the structure (Bardhan, 1989). Institutional innovation, which can be defined as a way of removing institutional barriers that constrain smallholder farmers from escaping the poverty trap (Tenywa et al., 2011), is important in facilitating institutional change. Institutional innovation is about formulating and entrenching alternative arrangements that help to minimize existing constraints to improved access to services and markets for inputs and outputs (Tatwangire, 2013). Even though a lot of institutional innovation has taken place over the last decade, there are still a lot of institutional bottlenecks, especially for smallholder agriculture in Africa (World Bank, 2007).

This study seeks to contribute to the existing literature by analyzing the performance of institutions and institutional change in a broader framework of impact evaluation of rural development interventions. The study develops a framework that links

institutional outcomes (specifically in access to input, output and credit markets) to the effectiveness of interventions in smallholder agriculture for rural development. Even though there is consensus in literature that institutions matter for rural development, most of the literature only focuses on specific aspects of institutions (such as credit markets, property rights and farmers' marketing cooperatives). In addition, there have also been no attempts by the MVP to evaluate the performance of the interventions in markets and their effect on project outcomes, despite their recognition of the importance of efficient markets in fostering agricultural growth and rural development. Further, most studies that carry out impact evaluation of development interventions only focus on economic outcomes, with minimal attention given to the role played by institutions in shaping the outcomes. This study attempts to fill this gap by using Sauri as a case study to analyze the effect of institutional changes resulting from MVP interventions on the achievement of the MVP goals of increasing agricultural productivity, enhancing household income and reducing poverty.

The specific objectives of the study are to analyze:

i. The performance of market-related institutional changes that were implemented by the MVP interventions. These include changes in relation to:
    a) Input markets
    b) Output markets
    c) Credit markets
ii. Whether the institutional changes promoted or undermined the success of the MVP interventions in agriculture and the nonfarm economy.

The rest of the chapter is organized as follows. Section 4.2 provides an overview of the Millennium Villages Project, with particular focus on specific interventions in market access (input, output and credit markets) and collective action. Section 4.3 presents a discussion on theories that explain the functioning of markets and also reviews studies on markets' performance and their implication for rural development. Section 4.4 discusses the analytical framework that guides the analysis of market-related institutions and their implication for rural development (more specifically, the success of MVP interventions). The section also outlines the method of analysis and data

sources. Section 4.5 presents the analysis and findings of the chapter, which are then discussed in section 4.6.

4.2 The Millennium Villages Project's interventions in market institutions

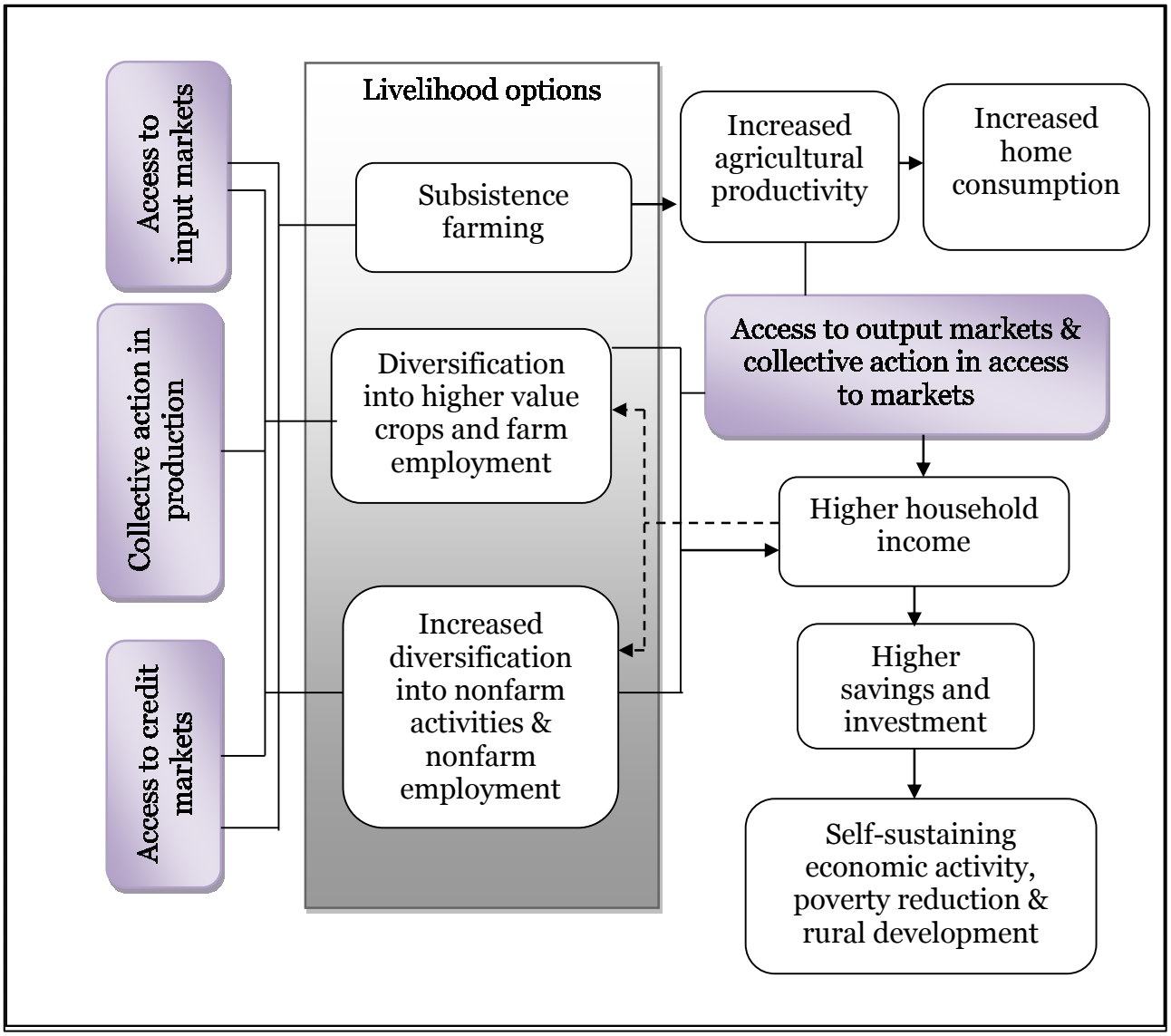
In addition to interventions discussed in Chapter 2 and 3, the MVP implemented various interventions that were aimed at enhancing access to input, credit and output markets (Nziguheba et al., 2010; MVP, 2008). Some of the institutional interventions included:

(i) Initiatives to enhance access to inputs through creation of linkages between farmers and input suppliers (especially agro-dealers).
(ii) Enhanced collective action in the production of higher value crops as a means of promoting crop diversification.
(iii) Initiatives to enhance access to credit (both microfinance and other formal sources of finance) from the second year of operation to enable the transition from the input subsidy to a credit-based system. By the fifth year, the focus was more on the mobilization of resources through organization of communities into cooperative-run microfinance institutions or partnerships with other financial institutions for management of micro credit.
(iv) Enhanced collective action in access to input, credit and output markets.
(v) Enhancing access to output markets through creation of cereal banks for both storage and joint marketing of produce, and creation of marketing cooperatives.

The theory of change was that enhanced access to input, credit and output markets would facilitate higher agricultural productivity and production, which could be translated into higher household income. The theory of change is summarized in Figure 4.1, which highlights the expected mechanisms through which increments in agricultural productivity and diversification could be translated into increased household income and poverty reduction and the role of market institutions. Access to input and credit markets are crucial for the enhancing the agricultural productivity of

small-scale subsistence agricultural farmers. Increased agricultural productivity would increase self-consumption of agricultural produce and also lead to increased household income, mainly through the sale of agricultural surplus.

Figure 4.1: Economic development through the MVP and the role of market institutions



Source: Author's own compilation

The link between agricultural productivity and household income in this model depends on access to efficient output markets. Households can generate additional income from sale of surplus if they have access to efficient output markets. Household income is also

enhanced through diversification into commercially-oriented farming (especially higher value crops) and nonfarm activities (including nonfarm employment). There were also efforts to increase access to credit as a way of providing capital for investment in crop diversification and nonfarm activities. Diversification into high-value crops was also carried out through promotion of collective action among farmers, whereby farmers accessed inputs and credit, produced output and accessed output markets jointly. Lastly, increased household income was necessary to spur household savings and investment and also to enhance participation in self-sustaining commercial activities by households, as well as poverty reduction and rural development.

4.3 Review of literature

This section provides a review of main theories that are relevant in explaining the performance of the input, output and credit markets. The section also provides a review of empirical literature on the importance of markets for rural development.

4.3.1 Theoretical considerations

Understanding the conditions under which markets fail or function at an inefficient level is important, especially for guiding the determination of relevant policies for fixing the inefficiencies (Ray, 1998). Various theories help in providing an understanding of the functioning of these markets. The theoretical foundation of the analysis of markets is mainly based on New Institutional Economics (NIE). NIE uses the neoclassical framework but takes transactions as the unit of analysis, relaxes the hypothesis of perfect information and emphasizes the importance of institutions as a means to reduce high transaction costs. The transaction cost literature goes back to the 1937 article by Coase, “Nature of the Firm,” where he argues that market exchange is not costless and the cost of a transaction has an important role in the organization of firms and contracts (Williamson, 2000). High transaction costs lead to coordination problems and market failure, which further increases the risks and the costs of exchange (North, 1990; Eaton and Meijerink, 2007).

NIE includes two broad but overlapping approaches, namely those of transaction costs and collective action (Lin and Nugent, 1995). The transaction cost approach has been useful in analyzing the comparative demand for alternative institutional arrangements. The collective action approach, on the other hand, emphasizes free-rider problems (which are the consequence of transaction costs) and has been useful in analyzing the supply of alternative institutional arrangements. Transaction costs and collective action have over time been developed separately, even though they are complementary.

The transaction costs theory

Transaction costs include the costs of organizing, maintaining and enforcing the rules of an institutional arrangement. The direct costs of an exchange could include the cost of (i) obtaining the information that the various parties need to assess the quantities and qualities of what is exchanged and the benefits and costs of the contract, (ii) negotiating among the parties to reach an agreement on the provisions of the contract and (iii) monitoring and enforcement of the contract. This third item includes indirect costs in the form of output lost due to contractual default. Transaction costs can be ex-ante or ex-post. Ex-ante costs include the direct and indirect costs arising from the contract selection process, including those of generating the relevant information and of drafting, negotiating and safeguarding the agreement. The ex-ante costs also include costs that arise from adverse selection. The ex-post transaction costs could include the costs of: dispute resolution and the establishment and operation of governance procedures; dealing with the maladaptation of the actual provisions of the contract, including its renegotiation; monitoring the contract; and bonding the contractual parties to continue to work together. The ex-post transaction costs include efficiency losses arising from moral hazard, i.e. distortions induced by the terms of contract.

The transaction cost theory suggests that institutional changes mainly result when institutional disequilibria exist and the transaction costs of change are not excessive (Lin and Nugent, 1995). Transaction costs can therefore be used to explain institutional changes, whereby an institutional arrangement is more efficient than other available options and requires less in total transaction costs than the other arrangements in the choice set (North, 1984 as quoted by Lin and Nugent, 1995). Exogenous shocks, such as

increased demand for institutional services or choices among a set of institutional arrangements, could render an existing institutional arrangement less efficient than one or more other arrangements in the choice set. Institutional change could also be caused by an exogenous shock in transaction costs (such as changes in technology, ideology, law, etc.). The most important sources of shifts in the demand for institutional service are derived from long-term changes in the relative abundance of factors of production. For instance, many countries have experienced a gradual evolution from conditions characterized by plentiful land and scarce labor to conditions of scarce land and plentiful labor in their development process, which has induced the establishment of private property rights to land.

The transaction costs analysis provides a framework for analyzing contractual choices (Lin and Nugent, 1995). Consider an example of an agrarian setting. If inputs (land and labor) are distributed equally, then the possible institutional arrangements are either that the households produce independently or they produce collectively as a community. For independent production, there are no monitoring costs, but the main disadvantage is the lack of possible gains of economies of scale and risk sharing. If inputs are distributed unequally, then three different arrangements can exist between the owners of land and labor (in addition to a collective arrangement). These are: hire labor at a fixed wage (fixed wage contract), rent the land out to the owner of labor at a fixed rent (fixed rent contract) or lease it out for a share of output (share contract). The rights and obligations of the owners of land and labor differ among these arrangements.

The imperfect information theory

Given that information costs constitute an important part of transaction costs, another theory closely related to the transactions theory of institutions is the imperfect

information theory. Under the imperfect information theory[16], the underlying rationales of institutional arrangements and contracts are mainly explained by the strategic behavior of parties under asymmetric information (Bardhan, 2000). The main idea is that lack of perfect and freely available information leads to risk and uncertainty in transactions (Doward et al., 2009). The incomplete and asymmetrical information implies that sellers could have more information than buyers regarding the availability and characteristics of the supply of products, while buyers could have more information than sellers about their demand and their ability and intentions to pay for products. Searching for necessary information is necessary to reduce the risks of transaction failure, which constitute an important source of transaction costs. The imperfect information theory has been fruitfully used in modeling many key agrarian and other institutions in poor countries, which are seen to emerge as substitutes for missing credit, insurance and futures markets in an environment of pervasive risks, information asymmetry and moral hazard (Bardhan, 2000).

Compared with the transaction costs theory, the imperfect information theory is cast in a more rigorous framework that clearly defines the assumptions and equilibrium solution concepts, fully outlines the implications of strategic behavior under asymmetric information and differentiates the impact of different types of information problems (Bardhan, 1989). The theory, therefore, yields more concrete and specific predictions about the design of contracts, with more attention to the details of terms and conditions of varying contractual arrangements under varying circumstances. Imperfect information[17] theorists also give more emphasis to ex-ante mechanism design in

[16] The dilemma of information asymmetry was well illustrated by Akerlof's (1970) article on the second-hand car market in the United States. Given that people buying used cars do not know whether the cars are "lemons" (bad cars) or "cherries" (good cars), they are willing to pay an average price (Doward et al, 2009). If the average price is low, then the suppliers will be more inclined towards a supply of only bad cars.

[17] The imperfect information theory is closely related to Williamson's theory of incomplete contracts, which focuses more on adaptive sequential decision-making rather than the comprehensive contingent claims contracts of the imperfect information literature (Bardhan, 1989).

contracts and less to maladaptation costs incurred when transactions drift out of alignment ex-post.

Collective action theory

The transaction cost and imperfect information theories are not clear on the mechanism through which new institutions emerge (Bardhan, 1989). The theory of collective action seeks to answer questions related to the conditions under which – and the extent to which – institutional change takes place. The theory helps explain the composition of interest groups, which can affect economic efficiency and long-term development (Lin and Nugent, 1995).

There are various definitions of the concept of collective action – "action taken by a group in pursuit of members' perceived shared interests," "joint action for the same goal," "actions to achieve a common objective, when outcomes depend on interdependence of members," etc. (Meinzen-Dick, Di Gregorio and McCarthy, 2004). In general, collective action requires the involvement of a group of people with shared interest who undertake common action in pursuit of that shared interest. Collective action can be used in decision-making (planning and implementation) and also in the designing and setting of rules, which determines the level of participation of the various agents – which, as discussed earlier, is an important determinant of project success.

Two kinds of collective action problems are relevant in the process of institutional change (Bardhan, 2000; Bardhan, 2005): (i) the bargaining problem where disputes about sharing the potential benefits from the change may lead to a breakdown of the necessary coordination and (ii) the free-rider problem regarding sharing the costs of bringing about change. The costs of collective action will be higher where there are winners and losers from a productivity-enhancing institutional change with concentrated and transparent losses but diffuse gains, and if the potential gainers cannot credibly commit to compensate the losers ex-post (Bardhan, 2000).

There are various theories that have been developed to explain collective action. The traditional theory of groups was developed in the '50s and '60s by different writers with

different views (Olson, 1965). The casual view of the traditional theory of groups provided that private organizations and groups were ubiquitous mainly due to higher human propensities to join groups or associations. Another key contribution was by Arthur Bentley, who developed the group theory, which provided that every group, regardless of its composition, had shared interests. Olson (1965), in his contribution towards the theory of collective action, argued that organizations are usually formed to further the common interests of the people. A public or collective good is provided for the group whenever a common interest goal is achieved.

The creation of social capital can facilitate or restrain collective action. The most popular definition of the concept of social capital is by Putnam (1993), as quoted by Bastiaensen, De Herdt and Vaessen (2002), who defines social capital as a society's endowments of voluntary networks, norms of reciprocity and trust. The basic idea of social capital is that the processes of social interaction within a society generate externalities that affect the development prospects of society as a whole (Bastiaensen, De Herdt and Vaessen, 2002). Therefore, a positive sum game[18] of social interaction between different individuals is very relevant for development interventions and poverty alleviation.

4.3.2 Empirical evidence on market failures

Market failures are prevalent in rural areas, where factor and product markets lead to inefficient allocation of resources, which has implications on rural poverty reduction (Dercon, 2008). Initial poverty and market failures reinforce each other to keep poor people in a poverty trap (Doward et al., 2009; Jayne, Mather and Mghenyi 2010). For instance, inefficiencies in input and credit markets will affect output markets mainly through smaller marketed surpluses and higher transaction costs and risks. Such conditions lead to: (i) failure of insurance markets because of high risks and the costs of monitoring behavior to protect against moral hazard and adverse selection, (ii) failure of

[18] This refers to a more equal distribution of access to resources, services, information and power that would improve the capabilities of the poor, as opposed to a zero sum game where the rich benefit at the expense of the poor (Bastiaensen et al., 2002).

credit markets because of the inability to insure borrowers, lack of collateral, lower loan repayment and limited diversification of local economies, all of which impede the development of a sustainable model of rural financial services, and (iii) weaker output markets resulting from limited surpluses.

Below is a review of empirical evidence on input, credit and output market failures and also on the determinants of success of collective action in access to markets.

Input markets

African input markets are underdeveloped and fragmented, with most farmers not being able to make use of improved seed varieties (AGRA, 2013; World Bank, 2007). Demand for inputs is largely seasonal (depends on planting seasons), which hinders the development of efficient input supply markets. Small-scale agro-dealers play a big role in increasing access to inputs in these rural markets (Odame and Muange, 2010). The input markets (mainly seed markets) have two overlapping systems: the formal system that represents the organized production and supply of improved seeds and the informal system that comprises farmer production systems (especially those retaining seeds from previous harvests or seed exchanges among farmers). It has been estimated that about 80 percent of smallholder farmers rely on seeds that have been saved from previous harvest or use the local seeds that are bought from the local market (Wekundah, 2012). There are various constraints to access to formal markets, key among them: high retail prices of inputs/liquidity constraints, lack of knowledge about the improved seeds, inadequate demand for inputs and also inadequate access to input markets (Odame and Muange, 2010). It is for these reasons that market failures in input markets are pervasive in Sub-Saharan Africa (World Bank, 2007). Decades of low input use have undermined Africa's efforts to increase agricultural productivity and income (Kelly, Adesina and Gordon, 2003).

Previous experience with increasing access to inputs in Africa revealed two key lessons (World Bank, 2007; Kelly, Adesina and Gordon, 2003). First, the development of rural stockists (agro-dealers) is critical for accelerating the access of the rural poor to quality agricultural inputs by stimulating demand for inputs, reducing the search costs faced by

farmers and making the inputs available in required volumes at affordable prices (Poulton, Kydd and Doward, 2006; Odame and Muange, 2010). Second, previous experience has shown that agricultural inputs can be made more affordable by packaging in smaller, affordable sizes, which would improve demand for the inputs and also reduce the risks of experimenting with new types of inputs (Poulton, Kydd and Doward, 2006; Kelly, Adesina and Gordon, 2003). The theory of change underlying packaging of agricultural inputs into small packages is that poor smallholder farmers gradually expand their capacity to acquire inputs as yields increase.

A common intervention in input markets has been the provision of input subsidies. There has been a resurgence in input subsidies across African countries in recent years, with an approximate expenditure of roughly US$ 1.05 billion (about 28.6 percent of public expenditure on agriculture) by 10 African countries (Jayne and Rashid, 2013). The resurgence has mainly been driven by the input subsidies' political appeal and also because the subsidies are a means of providing social protection to poor farmers (Morris et al., 2007; Jayne and Rashid, 2013). Despite the resurgence, there has been little consensus regarding the effectiveness of input subsidies. Some have argued that input subsidies make economic sense, such as Denning et al. (2009), who argued that the evaluation of the input subsidy in Malawi resulted in a cost to benefit ratio of 0.76 to 1.36. Others have argued that the cost of the subsidies has often been high with modest benefits (Morris et al., 2007). There is also empirical evidence showing that fertilizer subsidies are likely to be inefficient, costly and fiscally unsustainable (Doward, 2009; Morris et al., 2007). Morris et al. (2007) further argues that large-scale provision of input subsidies cannot have a lasting impact on agricultural productivity, income and poverty unless they are accompanied by investments in public goods.

Output markets

The expansion of output marketing opportunities is also a key precondition for the transformation of agricultural practices beyond subsistence agriculture, which is necessary for poverty reduction and rural development (De Laiglesia, 2006; Barrett, 2008; IDB, 2010). There is evidence showing that most rural households have low levels of participation in agricultural markets (IFAD, 2001). Previous experience has shown

that smallholder farmers mainly produce for self-consumption and participate in markets as net buyers (Alene et al., 2008; Jayne, Mather and Mghenyi, 2010; IFAD, 2001). They have limited and occasional amounts of produce for selling, and when they sell, they are faced with high transaction costs, they depend on the nearest local markets and they have lower bargaining power, given that they often need immediate cash. Many of the poor are also passive participants, who often sell low (immediately after harvest) and buy high, with limited choice of where to sell, to whom and at what price. For those with a surplus, their inability to market their produce implies a lack of income for production inputs, consumer goods, immediate cash requirements and asset accumulation.

Agricultural marketing systems in most African countries (see Jayne et al., 1997; Poulton, Kydd and Doward, 2006) are generally characterized by: (i) semi-subsistence agricultural structure whereby only a small percentage of production is marketed, leading to wide fluctuations in volumes traded and prices; (ii) primary forms of exchange involving small under-capitalized players, with high transaction costs; (iii) use of personalized trading networks, which reduces transaction costs of exchange but limits the scope of the market; (iv) volatile markets, mainly caused by inadequate storage capacity and also inadequate capacity to absorb shocks; and (v) inadequate mechanisms linking the smallholder farmers' market opportunities with pre-harvest services such as access to credit, input supply and extension services. Reduction in transaction costs not only ensures increased access to markets, but also results in large potential pro-poor growth benefits (Doward et al., 2004).

Credit markets

Access to credit is very important, given that engaging in productive activities requires funds for purchase of inputs and investment, which are necessary for the transformation from an agrarian economy into commercial farming and diversification into nonfarm activities. Financial constraints in agriculture still remain pervasive in Africa, which has mainly been attributed to the lack of collateral for accessing credit (assets) or the unwillingness to use the assets that are vital to local livelihoods as collateral, high costs of borrowing and long and tedious credit application procedures (World Bank, 2007;

Chisasa, 2014). In addition, the risk of income shocks in most rural areas is high mainly because of reliance on agriculture, which is greatly influenced by climatic conditions (Besley, 1994; Conning and Udry, 2005). The rural credit markets also tend to be segmented, which implies that a lender's portfolio of loans is concentrated on a group of individuals facing common shocks to their incomes in one particular geographic area. Also, different segments of borrowers are systematically sorted across different loan types and lending intermediaries according to the characteristics of the borrowers, the lenders and the activities financed, among other factors (Conning and Udry, 2005). Rural financial markets are also characterized by extreme variability in the interest rates that are charged on similar loans across the country, with shorter term interest rates being often higher than long-term interest rates despite the scope of moral hazards being larger in longer term contracts (Banerjee, 2001).

The most common observable market failure is the failure of rural credit markets to conform to the assumptions of perfectly competitive markets, whereby everyone with profitable projects is able to access credit at the prevailing interest rates. Efficiency failures in credit markets have been attributed to the lack of information, the need to provide appropriate incentives and limits to contractual enforcement (Ray, 1998; Conning and Udry, 2005). Information imperfections are very important in explaining the segmentation of credit markets, whereby information flows are well established over relatively close distances and within social groups. The characteristics of individuals among small groups tend to be well known, which makes monitoring borrowers' behavior less costly. Use of collateral in credit markets is a means of handling the problems of asymmetric information (such as moral hazard and adverse selection[19]) and

[19] Adverse selection occurs when lenders do not know particular characteristics of borrowers, such as uncertainty about a borrower's preference for undertaking risky projects (Besley, 1994). In the presence of adverse selection, lenders could reduce the amount of loanable funds, resulting in credit rationing. Moral hazard, on the other hand, could arise when lenders are unable to discern the borrowers' actions, such as debtors slackening their efforts in implementation of the projects or changing the type of project. While adverse selection leads to inefficiency in credit markets, moral hazard might not necessarily lead to market inefficiency if the debtor borrows money from one lender and the lender imposes the cost of increased risk-taking only on the debtor.

enforcement problems, which characterize most rural credit systems (Hoff and Stiglitz, 1990; Besley 1994). Given the lack of collateral among many rural smallholder farmers (Besley, 1994; Hoff and Stiglitz, 1990) and also the fact that high interest rates will discourage good borrowers but might not deter bad borrowers (Ray, 1998), the solution has been lending through groups.

Credit market interventions have long been at the center of policy interventions in rural development in developing countries over time, with considerable resources being devoted to supplying cheap credit to farmers (Dercon, 2008; Hoff and Stiglitz, 1990). An example of an institutional innovation in credit markets that was aimed at increasing access to credit was the project for financing Joint Liability Groups (JLGs) in 2005-2006 in India. The JLGs sought to increase credit flow by identifying collateral substitutes like peer pressure and social collateral (Pillarisetti and Mehrotra, 2009). JLGs were mainly informal groups of small/marginal farmers and sharecroppers with about 4-10 members who could either jointly or singly apply for a loan. Evaluation of this project indicated that smallholders and tenant farmers were more able to access bank credit at cheaper rates as compared to the interest rates offered by informal moneylenders (Pillarisetti and Mehrotra, 2009). However, in general, it has been argued that the results of many of interventions in credit access have been disappointing, which has partly been attributed to the inadequate understanding of the workings of rural credit markets (Hoff and Stiglitz, 1990).

Collective action and social capital

Farmers' organizations and collective action are often seen as key factors in enhancing farmers' access to credit and markets (Hellin, Lundy and Meijer, 2007). The success of collective action depends on various factors. For instance, there is evidence in literature that shows that the success of collective action partly depends on the type of market being accessed by the smallholder farmers (Markelova and Mwangi, 2010). Local markets have less competition from larger producers and may therefore benefit minimally from collective action since each farmer can sell individually. Similarly, the type of products also matter. Staples, such as maize, are easy to store and transport, with a good proportion of such crops usually destined for local markets and local

consumption. Also, the marketing of staples in rural Africa is associated with high transaction costs and lower revenue (Barrett, 2008; Alene et al., 2008). Even though collective action may have advantages in terms of bulking and storage, quality control and access to inputs, the marginal benefits from collective marketing may not be enough to offset the higher transaction costs and lower revenues.

There are various conditions that have been shown to influence the success of collective action initiatives. Lin and Nugent (1995), based on Olson's theoretical analysis of a static game, argue that collective action will be feasible depending on the group size[20], homogeneity of origin of members, membership period, social and physical proximity, level of goal differentiation and inequality in wealth or power among participants. Thus, the time group members spent together and their "geographical or sectoral concentration" makes the nature of collective action more dynamic. Further, the success of collective action is influenced by environmental circumstances in which members find themselves, availability of "political entrepreneurship," success or failure of other similar groups and expertise in the management of collective action. Another influential factor is the type of prevailing property rights; for example, the lack of secure access to resources undermines participation in collective action. Poteete and Ostrom (2003) further elucidate the conditions for success of collective action by arguing that collective action is facilitated by the characteristics of the collective problem, characteristics of the group, institutional arrangements, technology and the actions of national governments and other external actors. Using examples from natural resource management that can also be relevant for smallholder marketing, Markelova and Mwangi (2010) argue that the effective formation and functioning of groups largely depends on three broad categories of factors: characteristics of the resource (boundaries, size); characteristics of the user groups (shared norms, level of social capital, endowment heterogeneity); and institutional arrangements (access and management rules, enforcement mechanisms, accountability structures).

[20] Smaller sizes are preferable because of ease of communication among members and also because of lower incentives for free riding.

In line with collective action, the presence of social capital has also been found to foster development (Bastiaensen, De Herdt and Vaessen, 2002; Woolcock and Narayan, 2000)[21]. Social capital influences development through: better information flow, more effective and cheaper contract enforcement, fostering collective action and prospects for the development of informal mutual insurance mechanisms. In relation to the role of social capital in rural development interventions, Woolcock and Narayan (2000) argue that technical and financial soundness is a necessary but insufficient condition for acceptance of a project by poor communities. Understanding how proposed policy interventions affect the power and political interests of the stakeholders is important, given that all policy interventions occur in a social context characterized by a mix of informal organizations, networks and institutions.

Two key aspects are important when linking social capital to development interventions (Bastiaensen, De Herdt and Vaessen, 2002). First, development interventions are embedded in different structures each with their own rules and culture. Local embeddedness is necessary for the achievement of the right level of synergy with local institutions. Second, an external organization that implements the development intervention would require some level of independence and organizational integrity in order to maintain the comparative advantage in the development process. Further, the effect of the development intervention is determined by: (i) the precise articulation between the intervention and the local institutional environment, (ii) the specific intervention strategies that determine the scope and path of local change and (iii) project design principles such as ownership, participation and collective action.

4.4 Methodology

This section provides an overview of the analytical framework and the method of analysis of the study. The analytical framework is mainly guided by New Institutional Economics and the Institutional Analysis and Development Framework (Ostrom, 2011).

[21] For instance, the developmental performance of Northern Italy was attributed to a higher endowment of social capital as compared to the South (Bastiaensen, De Herdt and Vaessen, 2002).

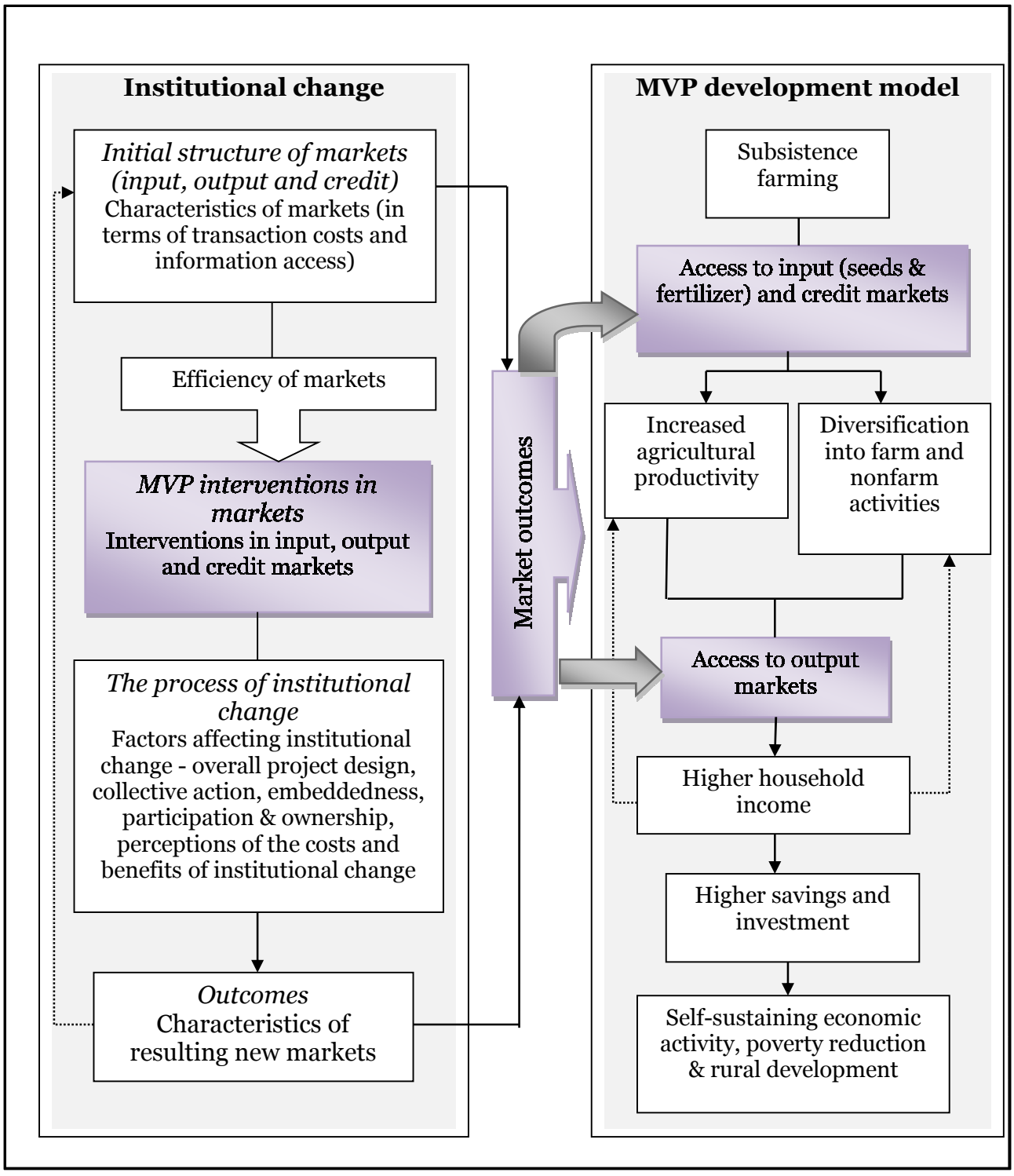
The framework provides an overview of the process of institutional change following the implementation of MVP interventions and how the outcomes of institutional change affect the realization of the MVP goals of increasing agricultural productivity and household income. Further, the section on method of analysis outlines the estimation techniques that are used in assessing (i) the impact of transaction costs on market access and (ii) the determinants of access to credit.

4.4.1 Analytical framework

The analytical framework looks at the process of institutional change from one level of equilibrium to another level of equilibrium and provides an assessment of the implication of the institutional change on effectiveness of MVP interventions. It is mainly guided by New Institutional Economics (focusing on transaction costs, collective action and imperfect information) and also based on the Institutional Analysis and Development Framework as discussed by Ostrom (2011). The analytical framework takes into consideration what are perceived as the most important elements of the institutional debate concerning development and poverty alleviation (Bastiaensen, De Herdt and Vaessen, 2002). The overall goal is to link the institutional perspective with the theme of development intervention in the field of poverty alleviation and local development.

The analytical framework is shown in figure 4.2. The first step of the analysis is to assess the structure of the initial market conditions before MVP interventions. The idea is to ascertain the rationale of institutional change by identifying specific characteristics that have rendered the markets inefficient. Given the difficulty in assessing the relative performance of institutions, the proposed approach does not identify any efficiency criteria but seeks to assess whether the institutional arrangements produce desirable outcomes. In addition, further analysis using the transaction costs analysis framework is used to analyze the efficiency of output markets. If the institutional outcomes are not desirable, then institutional change would be necessary to be able to reach a more efficient outcome (Herrera, Van Huylenbroeck and Espinel, 2005).

Figure 4.2: The analytical framework



Source: Author's own compilation

The second and third steps of the analysis entail further interrogation of the process of institutional change in order to understand the factors affecting the structure of the institutions and how they evolve over time, taking into consideration how earlier outcomes affect future perceptions and strategies. Specifically, the second step involves the choice of institutional interventions that necessitate movement to a new equilibrium level. If the institutional arrangement is regarded as a bottleneck, then a choice can be made from the existing institutional alternatives to ensure that a more efficient outcome is derived.

As Herrera, Van Huylenbroeck and Espinel (2005) put it, the choice of the institutional alternative will entail interaction of different individuals with different interests, who will work together to either improve on the existing institutional arrangement or build a new and more efficient arrangement. In our framework, we apply the transaction costs, imperfect information and collective action theories to analyze whether the institutional changes that were initiated by the MVP resulted in more efficient outcomes.

Other factors that determine successful movement to a new institutional arrangement include: the embeddeness of the new institutional arrangement into existing structures, perceptions of smallholder farmers regarding the costs and benefits of the change and participation and ownership of the process. The overall project design is also key, given that chances of success of a poorly targeted intervention (without adequate understanding of the socio-economic structure of the rural community) are minimal (Bastiaensen, De Herdt and Vaessen, 2002).

An assessment of whether the resulting institutional outcomes are more efficient than the initial institutional structures is carried out by looking at the level of transaction costs and information asymmetry. The new institutional arrangements will be more efficient if they have lower transaction costs and better information flows. We take note of the possibility of reversal back to the initial institutional structure. For example, enhanced access to input markets will not be sustained if smallholder farmers revert back to using part of their farm produce as inputs instead of the improved seeds.

Lastly, the framework assesses the implications of the institutional changes to the overall MVP goals of increasing agricultural productivity and household income, and consequently of poverty reduction. A movement to a more efficient institution will most likely promote the achievement of the MVP goals. For instance, it is expected that increased access to inputs and credit would enhance agricultural production and consequently lead to higher agricultural surplus. With more efficient output markets, the agricultural surplus is translated into higher household cash income, thus ensuring the effectiveness of the MVP interventions.

4.4.2 Method of analysis

This study largely uses both descriptive and analytical methods of analysis. The focus of the analysis is on the institutional environment that is relevant to agricultural development within the millennium villages, which includes interactions within (i) input markets, (ii) output markets and (iii) credit markets. Institutional changes in this study are measured as differences in institutions between the before and after of the MVP. Following from the design and implementation of the MVP interventions, we hypothesize that the expected institutional changes following the implementation of the MVP interventions in agriculture are:

i. There is increased access to inputs, given the creation of linkages between farmers and input sellers (agro dealers).
ii. There is increased access to credit for purchasing inputs and for investing in a diversified portfolio, given the creation of inter-linkages between the farmers and credit institutions. Access to credit is also enhanced through increased collective action.
iii. With generation of agricultural surplus resulting from increased productivity and the MVP interventions in market access, the markets for output are expected to be enhanced and more efficient, with possibly higher output prices, a reduction in transaction costs and improved information sharing. The theory of change, therefore, entails increasing access to output markets with better prices (mainly through encouraging stocking of output and selling when prices are high).
iv. There is enhanced collective action, mainly through farmer groups who come together with a common goal of increasing production and jointly accessing

markets. A good illustration, which can be seen as an institutional innovation, is the case of cereal banks where farmers jointly stored output and sold the output at higher prices.

Quantitative analysis is used to assess the effect of transaction costs on marketing of output and determinants of demand for credit.

Transaction costs in output markets and their effect on market access

Following from Maltsoglou and Tanyeri-Abur (2005), transaction costs that are incurred in output markets can be classified as information, negotiation and monitoring and enforcement costs.

i. Information costs (*ex-ante*) relate to the costs incurred in obtaining information relative to the undertaking of the transaction (price information, market location, etc.). They are measured by the time lag between market prices becoming known and the time of sale, i.e. whether the farmer gets to know the price before going to the market or after arriving at the market.
ii. Negotiation costs represent the costs incurred while the transaction is being carried out (negotiation terms of exchange, drawing up the contract, etc.). Negotiation costs can include the cost of transport incurred when transporting goods to the market. The damage to the goods during transportation and the time spent at the market waiting to sell the produce is another form of negotiation cost.
iii. Monitoring and enforcement costs (*ex-post*) are the costs incurred once the transaction is completed and in order to ensure that the terms agreed upon *ex-ante* are adhered to (payment arrangements). The number of times that the farmer has to approach the merchant to get paid can vary, and as it increases, the costs incurred to set time aside to go to the merchant to obtain the payment increase. A second monitoring cost is the loss incurred when the final sale price obtained is less than the sale price agreed upon.

To assess whether transaction costs influence access to output markets and market integration[22], the transaction costs are regressed on:
(a) the quantity of output sold using a log-linear model as shown in the equation below.

$$LogQ = \alpha_0 + \alpha_1 P + \alpha_2 Point + \alpha_3 LowP + \alpha_4 Damage + \alpha_5 Wait + \alpha_6 Pay + \varepsilon$$

Where ε is the random error term and is assumed to be normally distributed.

(b) the type of market accessed (as a proxy for market integration) using a logit model, which is a commonly used approach for binary dependent variables.

$$MA = \beta_0 + \beta_1 P + \beta_2 Point + \beta_3 LowP + \beta_4 Damage + \beta_5 Wait + \beta_6 Pay$$

where:
Q is the quantity of output sold; P is the price of maize; Point is the point at which the prevailing price is known; LowP is selling goods at a lower price than anticipated; Damage is damage to goods during transportation to the market; Wait is waiting time at market before selling goods; Pay is payment period; and MA is market access. See Table 4.2 for the definition and measurement of variables.

The type of market accessed is represented by a dummy, where 1 represents local markets (both retail and wholesale) and 0 represents other markets. It is hypothesized that the existence of a significant effect of transaction costs on output markets implies that the output markets are not efficient and therefore measures are needed to change the system to a more efficient equilibrium level.

[22] Note that this analysis is only for the period after the MVP because of a lack of baseline data. While the analysis does not reflect institutional changes, it sheds some light on whether transactions are still an impediment to market access after implementation of the MVP.

Determinants of access to credit

An assessment of the factors that determine access to credit is carried out to provide an understanding of the functioning of the credit markets in Sauri. To assess the factors that determine whether households access credit and the choice of the source of credit, we estimate a logit equation with the question on whether a household head had ever applied for credit or not as the dependent variable. The factors affecting the demand for credit[23] are categorized into two: the individual/household characteristics and the attributes of the financial institutions, such as the terms of credit. The individual/household characteristics that influence the demand for credit include:

(i) Sex of the household head – because of the status of ownership of assets in most rural African cultures, female-headed households are less likely to access credit as compared to their male counterparts.

(ii) Age of the household head – based on life-cycle hypothesis, the younger the household head, the more likely they will be able to access credit.

(iii) Education of the household head – more educated household heads are more likely to access credit than the less educated household heads.

(iv) Size of land – land is an important source of collateral for most rural credit systems. Thus higher land sizes are associated with a higher likelihood of accessing credit.

(v) Status of land ownership – legal ownership of land is required if land is to be used as collateral. Therefore, household heads with formal land title deeds are more likely to access credit than those without.

Among the attributes of the financial institutions that may affect an individual's/household's decision to access credit facilities are:

(i) The cost of borrowing – higher costs of borrowing are expected to lower the demand for credit.

(ii) Terms of credit; for example requirement of collateral is a major impediment to accessing credit.

(iii) Distance to the financial provider (accessibility) – more accessible financial institutions increase the demand for credit.

[23] Regarding the choice of independent variables, see Mpuga (2008).

4.4.3 Definition and measurement of variables

Table 4.2 describes the variables that were used in the analysis and their measurement.

Table 4.2: Definition and measurement of variables

Variable	Type and definition	Measurement
Sex of household head	Dummy, sex of household head	1 if male, 0 if female
Age of household head	Discrete, age of household head in years	Age of household head, measured by number of years
Years of education of household head	Discrete, number of years of education of household head	Number of years of education of household head
Land	Discrete, size of land holding	The size of land owned by household in hectares
Land ownership	Dummy variable representing legal ownership of land	1 for land with title deed, 0 for land without title deed
Access to financial institutions	Dummy variable	1 if not easily accessible, 0 if easily accessible
Borrowing costs	Dummy variable	1 if high borrowing costs, 0 if low borrowing costs
Collateral	Dummy variable	1 if lack of collateral is a constraint to access credit, 0 if it is not a constraint
Application for credit	Dummy variable	1 if an individual applied for credit, 0 if individual never applied for credit
Quantity of output for sale	Discrete, number of bags of maize for sale	Number of bags of maize available for sale after fulfilling home consumption needs
Market access	Dummy variable , type of market accessed	1 for local market (wholesale and retail), 0 for other markets

Price	Discrete, price of maize output	Price of maize per *gorogoro*[24] in KES
Transaction costs		
Type of transaction cost	**Proxy used**	**Measurement**
Information	Point at which the farmer gets to know the price	A dummy variable – 1 is before going to the market; 0 is at the time of sale
	If ever sold goods at a lower price	A dummy variable – 1 is yes, sold at lower price; 0 is never sold at lower price
Negotiation costs	Whether farmer has ever damaged goods while transporting to the market	A dummy variable – 1 is yes; 0 is no
	Time taken at marketplace before selling goods	A dummy variable – 1 is less than 6 hours; 0 is more than 6 hours
Monitoring and enforcement	When the farmer receives payment for the goods	A dummy variable – 1 is immediately; 0 is later

4.5 Research Findings

This section provides an overview of our research findings. The section is organized in three subsections covering (i) access to input markets, (ii) access to output markets and (iii) access to credit.

[24] This is a two-kilogram tin that is commonly used in rural Kenya to measure cereals.

4.5.1 Enhancing access to input markets

Before the MVP's inception, access to inputs (seeds and fertilizer) was limited. There were only two input stockists within the millennium villages, with some farmers having to travel far to access inputs, which increased transport costs. Demand for inputs was also low, which was mainly attributed to lack of financing. To meet the low demand of the improved farm inputs and make the inputs more affordable, stockists would package the inputs into smaller units, such as one- or two-kilogram packs.

As part of the MVP interventions in agriculture, access to inputs was initially increased through the input subsidies that were provided in phases across the villages (Nziguheba et al., 2010). During the first year of the MVP, farmers received a full subsidy of inputs (fertilizers and certified seeds). The Sauri community received a total of 800 of 50-kilogram bags of DAP and 800 50-kilogram bags of Urea in 2005 (MVP, 2006). Inputs were acquired through local distributors (agro-dealers), who received supplies directly from the major distributors in the region. To make the inputs affordable, farmers were allowed to repay their loans using a proportion of their farm produce. They were required to give 10 percent of the surplus from their harvest as payback for the inputs (fertilizer and maize seeds) they had received, which would be used towards the school feeding program. About 7 percent of the farmers did not give any payback because they had large families and small farm sizes, and hence their surpluses were marginal, and some even had food shortfalls for the year (MVP, 2006). Estimates from the MVP showed that payback for the inputs in 2005 averaged 8.3 percent of the total surplus and 3.5 percent of the total maize produce. Given that the cost of inputs (fertilizer and improved maize seeds) was US$ 69,465.00, the payback was equivalent to US$ 7,690.00, representing a total subsidy after payback of 89 percent.

As a measure to ensure sustainability, the project in the second year reduced the amount of input subsidy given to the farmers. The farmers were required to access credit for purchasing inputs through microfinance institutions and later through formal banking institutions (mainly Equity Bank). However, our survey results show that access to inputs through formal credit financing (discussed in detail in section 4.5.3) had limited success. This finding is corroborated by earlier findings by the MVP that showed that

only a small proportion of farmers were able to acquire credit for inputs. According to the MVP (2009b), only 67 farmers acquired loans through Equity Bank totaling 817,310 KES (US$ 11,300) for enough fertilizer to apply to 1.5 acres of land per farmer. A total of 125 vulnerable farmers received subsidies in the form of farm inputs. This accounts for a very small proportion of the total number of households within the Sauri cluster, which was estimated at 13,923[25] households in 2009. From our survey, the farmers indicated that lack of tangible collateral and cost of financing were the main barriers to accessing credit. The only available collateral was the small parcels of land, which the farmers were not willing to use as collateral because of the fear of losing the land in case of default in loan repayments. As a result, most farmers had to revert back to their initial position of individually sourcing inputs, which depended mainly on whether a farmer could afford the inputs. Some farmers also reverted back to use of local seeds. Statistics from Sauri indicated that about one third of the sampled households (324 out of 1,160 households) used local seed and no fertilizer or very little fertilizer (MVP, 2009b).

Further measures were put in place by the MVP to increase access to inputs through formation of farmers' cooperatives, i.e. *Kilimo ni Uhai*[26] and Indigent (vulnerable) farmers' cooperatives. *Kilimo ni Uhai* was meant to help their registered members have access to farming inputs at subsidized prices. In *Kilimo ni Uhai,* the farmer was to deposit a bag of maize produce or cash to the cooperative society in exchange for farm inputs. To be a member, farmers were required to contribute 270 KES (about US$ 3.2) as membership fees and a minimum of 10 shares, equivalent to 2,000 KES (about US$ 24). The farmers collected inputs from MVP stores at the market service center after paying the required fees. Where farmers were not able to travel to the market centers individually, they contributed money through *Kilimo ni Uhai* committee representatives, who then purchased the inputs on their behalf. The Indigent society, on the other hand, helped vulnerable farmers to access their farm inputs from a revolving fund and accepted repayment in the form of agricultural produce, mainly maize output.

[25] Republic of Kenya. 2010. *Kenya population and housing census: Population distribution by administrative units* (Vol. 1A). Nairobi, Kenya: Government Printers.

[26] A Swahili phrase meaning "Farming is life."

Each cooperative society had its own bylaws and drew representation from the 11 millennium villages.

From the survey findings, we can deduce that the low access to credit for purchasing inputs and the use of local seeds reflects the inadequate access to credit by the smallholder farmers after the phasing out of the input subsidies. Further, it is also possible that uptake of access to inputs through cooperative societies will be very low. This is because the membership fees were likely to be unaffordable by many households, given that our data indicates about one third of the sampled households had a monthly income of less than 2,000 KES (about US$ 24). Overall, our results indicate that the changes in access to inputs that were initiated by the MVP were not sustained, which has implications on the sustainability of the productivity gains. Further, the fact that some households reverted back to their traditional farming methods of using local seeds and no fertilizer is an indication that inefficiencies in input markets were still present after MVP interventions.

4.5.2 Enhancing access to output markets and role of collective action in the marketing of produce

4.5.2.1 Changes in the marketing of produce

Before the MVP, the supply of farm produce was limited by low agricultural productivity, which was attributed to limited use of improved agricultural inputs. Sale of available farm produce was mostly carried out individually to individual community members and through the nearby local market.

After the MVP, there were specific interventions aimed at enhancing output access. This was necessitated by increased agricultural productivity following the implementation of MVP interventions in agriculture. Our data reveals that more households in the millennium villages had surplus for selling, as compared to the control group. 109 farmers out of 223 sampled farmers in the millennium villages indicated that they had surplus for selling as compared to only 41 farmers out of 180 sampled farmers in the control villages. However, we noted that even though some of the households indicated

that they had agricultural surplus for selling, our data shows that about 25 percent of the households in the millennium villages sold the output even when the supply was not adequate, i.e. the supply could not last until the next harvest season. This was mainly because the households needed cash to finance other household needs – for example, selling some of the maize cereal to get cash to pay at the grain milling machine to process maize flour or buy other household necessities.

To increase access to output markets, the MVP encouraged collective action in the marketing of farm produce, which was expected to lower transaction costs and also ensure that farmers sold their produce at better prices. After the first bumper harvest following the full input subsidy, the concept of cereal banks was introduced in 2006 in Sauri to ensure that farmers sold their produce at higher prices and also to reduce exploitation by middlemen. A cereal bank was basically a store room (rented by farmers) that was strategically placed around the market area, where members stored their produce so that they could sell when prices were more favorable. A sample of farmers was taken for a study tour of existing cereal banks in the region and also trained in opening and managing cereal banks. A total of 11 cereal banks were established by 2007, with each village having one cereal bank. The MVP provided start-up funding of 500,000 KES (about US$ 5,950) for each cereal bank group to start a cereal business, which was to be repaid within 2 years (MVP, 2009a).

Cereal banks operated through a management committee, which was elected during *Barazas*[27]. The management committee comprised 12 members (chairman, secretary, treasurer, organizing secretary, assistant treasurer and seven other officials representing sectors such as health, education, water, roads, energy, enterprise and environment). These officials mobilized the community for the annual general meetings (AGM) and contributions. Share contribution was in form of cereals, i.e. 20 kilograms of maize as a share contribution for membership and then top-up would be accrued to shares. The cereal banks operated by selling agricultural produce, for example through tenders to schools and hospitals. The profits earned would be shared among the members in the

[27]These are village-level gatherings/meetings usually organized by the local government administration.

form of dividends, which were dependent on the amount of shares (determined by output quantity) owned by individual farmers. Average membership of cereal banks was about 180 members. The cereal banks were guided by a constitution that was drafted by the management committee, with assistance from the MVP.

The performance of cereal banks varied. Only one cereal bank (Marenyo Cereal Bank) with membership of about 260 members was still functional in 2009. Information collected from key informants and focus group discussions highlighted various reasons for the success of Marenyo Cereal Bank. Some of the reasons included:

(i) Management of the operations of the cereal bank was transparent, with frequent meetings for status updates and collection of shares.
(ii) There was proper record-keeping, which ensured accountability of all proceeds.
(iii) There was timely payment of dividends to members.
(iv) They were able to enhance their stock by outsourcing cereal produce from other regions to supplement the supply from members.
(v) They diversified their portfolio to include supply of both farm inputs and outputs, which they sold to both members and non-members.
(vi) Because of good performance, they were able to access credit from a bank (they received 250,000 KES (about US$ 3,000) from Equity Bank), which enabled them to transition from small-scale retail business to bulk buying and selling of farm inputs and produce. The additional credit also enabled them to transform into Marenyo Farmers' Cooperative.

On the contrary, the collapse of the other 10 cereal banks was mainly attributed to the following:

(i) Lack of transparency in the management of the cereal banks. Most members were not aware of the activities of the cereal banks of which they were members, which created a high sense of mistrust and dissatisfaction.
(ii) Poor governance and mismanagement of the cereal banks. Most farmers indicated that they never received any dividends even after contributing their shares of output.

(iii) There was poor record-keeping, which made it difficult for members to ascertain the status of the cereal bank's operations.

(iv) The constitution was weak in terms of enforcement measures, i.e. there were no explicit redress measures to be taken against committee members who mismanaged funds, which discouraged most members from contributing further to the cereal banks.

Further, after the collapse of most of the cereal banks, the MVP developed a Market Service Centre (MSC), which was aimed at improving farmers' market access through the collective and centralized marketing of produce (MVP, 2009b). Its objective was to enhance the collective centralized marketing system (farmers selling as a group) through the bulking of produce for bulk sale and value addition. Cooperative societies were established to enhance the operationalization of MSC, including societies for bee-keeping, poultry, horticulture and fish and the *Kilimo ni Uhai*/Indigent society. Each society had its own by-laws and representation from the 11 millennium villages. See the appendix for an example of by-laws for Gem Poultry Farmers' Cooperative Society Limited. The by-laws explicitly identify rules of operation of the farmers' cooperative, including the society's core principles and values, qualifications for membership, formation of management committee and conditions for eligibility, requirement for attendance of meetings, etc. Even though operationalization of the MSC was at the initial stages in 2009 when our fieldwork was carried out, our discussions with key informants and focus group members revealed that the MSC was facing the challenge of inadequate supply of produce for bulking and selling, which was partly attributed to insufficient production due to the small land sizes. Further, it was not clear whether any lessons were drawn from the failure of the cereal banks, especially in terms of group dynamics that could have undermined the success of the group initiatives.

In addition to enhanced collective action for the marketing of produce, there was increased formation of common interest groups, which were involved in various activities for empowerment. With the focus on "agriculture as a business" during the second year, several producer groups were formed where farmers were to produce surplus for income generation and also for nutritional diversity (MVP, 2006). After

sensitization from the MVP, farmers formed three main enterprises (for growing bananas, tomatoes and onions).

4.5.2.2 Assessment of the effect of transaction costs on the marketing of output

In accessing output markets, our data reveals that majority of the farmers who sold their produce at the local market for both millennium and control villages knew the prevailing price before going to the market. On the contrary, a larger proportion of farmers who sold their goods at the local market in both millennium (58 out of 82) and control villages (24 out of 37) indicated that despite having knowledge of the market prices for the goods prior to going to the market, they sold their goods at a lower price. This implies that they did not get the anticipated price of the commodities. Fewer farmers accessing local markets in both millennium (14 out of 72) and control villages (6 out of 38) indicated that they had ever damaged their goods while transporting them to the market. In terms of waiting time before selling goods at the local market, a majority of the farmers in both millennium and control villages indicated that they sold their goods in less than six hours. In addition, a majority of the farmers indicated that they were paid for the goods immediately when the transaction took place.

We used regression analysis to assess whether transaction costs significantly affected access to output markets. The results obtained by regressing quantity of output sold on various measures of transaction costs by using a semi-log function are shown in Table 4.3. The model is estimated for the total sample and the MVP because the sample of households in the control group who were found to participate in output markets was very small. For the total sample, the results reveal that only transaction costs associated with the waiting time at the market before selling goods and when actual payment is made significantly affected the quantity of output sold in the market. This implies that a farmer would sell less output if they had to sell their produce within a few hours of arrival at the market and also if payment was required immediately. For the MVP, the results reveal that only transaction costs associated with the point at which the price is known and when actual payment is made significantly affected the quantity of output sold in the market.

The results imply that farmers would sell more when they got to know the price before going to the market. However, when the payment for the goods was required immediately, less volumes of output would be sold. This implies that more output would be sold if the transaction was on credit, which points towards the households' liquidity constraints and reliance on credit purchases.

Table 4.3: Effect of transaction costs on market access

	Log of output sold		Type of market accessed	
	Total sample	MVP	Total sample	MVP
Price of output	-0.001	0.003	0.08***	0.064
Point where prices are known	0.313	0.399**	-19.05*	-17.979*
Selling at lower prices	0.201	0.165	-1.253	-1.259
Damage to goods	0.116	0.152	-2.806*	-2.802*
Waiting time at the market	-0.474**	-0.378	-2.31	-2.415
Payment for goods	-0.643**	-0.615***	2.537	2.437
Constant	2.181*	1.884*	19.587*	19.242*
Number of observations	111	93	111	93
F (7, 101)	3.12	2.24		
Prob > F	0.0075	0.047		
R-squared	0.119	0.115		
Root MSE	0.901	0.888		
LR $chi^2(5)$			231.06	408.48
Prob > chi^2			0.000	0.000
Pseudo R^2			0.338	0.339

*, ** and *** stand for 1 percent, 5 percent and 10 percent significance levels, respectively.

Note that the standard errors are robust.

The results of the logit estimation of the effect of transaction costs on market integration are also shown in Table 4.3. For the total sample, the results show that the price of output and transaction costs related to the point of knowing prevailing prices and the

damage to goods significantly affected the choice of markets. The likelihood of selling at the local markets is higher when prices of output are higher. Also, knowing prices before going to the market reduces the likelihood of selling at the local markets. This shows that the knowledge about prices enabled the farmers to make a choice regarding where to sell their produce. Lastly, higher transaction costs that are associated with damages to goods during transportation significantly affected the choice of markets. Higher damages are associated with markets that are beyond the local markets. Thus, farmers were likely to sell their produce in local markets to reduce the likelihood of damaging goods during transportation to more distant markets. This finding demonstrates the importance of good infrastructure for the marketing of agricultural produce in rural areas. For the MVP, only the transaction costs associated with the point at which the prices were known and the damage to goods during transportation significantly affected the choice of markets.

4.5.3 Enhancing access to financial services

Our data reveals that about 55 percent of the sampled households in the millennium villages would source credit from their friends and families, as compared to about 70 percent of the sampled households in the control villages. About 10 percent of the sampled households in the millennium villages would source credit from savings and credit cooperative societies (SACCO), as compared to 4 percent of the sampled households in the control villages. Banks and informal lenders accounted for only 6 percent and 9 percent of credit access by the sampled households in the millennium villages, respectively, as compared to 2 percent and 6 percent, respectively, of credit access by the sampled households in the control villages. An earlier survey by the millennium villages corroborated this finding of limited use of formal sources of finance by showing that most households relied on informal savings and remittances as their main sources of finance (MVP, 2006).

To enhance access to finance by the MVP, table banking was initiated in Sauri in 2006 with an aim of empowering mostly women, who could access credit from their groups at favorable terms of payment (low interest rates and tailor-made repayment plans). Under table banking, community members were encouraged to form groups and save

money within the group through accumulation of shares, which was then loaned to members at low interest rates and operated as a revolving fund. This concept has been widely used in Kenya (both rural and urban) over time, especially among women and youth groups.

Further, there were efforts to link farmers to a savings and credit organization (microfinance) at an initial stage of phasing out of the input subsidy. Farmers were linked to a microfinance institution called SAGA. SAGA offered three main products, i.e. savings, credit and check clearance. Membership was through payment of a membership fee (350 KES – about US$ 4) and submission of relevant documentation. The institution offered loans only to groups, with minimum membership of five. The group members were required to save for at least three months to be eligible for a loan. The interest rate on loans for farmers was 2 percent per month over a six-month repayment period. The inability to pay within the six months attracted a penalty of 5 percent of the loan per month. The 2 percent interest rate was high, given that the average lending rate for most savings and credit organizations in Kenya is about 12 percent per annum.

SAGA concurrently operated the MVP lending program together with their normal SACCO business. The performance of the two programs was varied, with MVP loans recording very low repayment rates as compared to SACCO's main lending programs. Table 4.4 gives a summary of SAGA repayment rates for the MVP loans for the 11 villages. Only two villages (Jina and Gongo) had repayments rates that were slightly above 50 percent. Millennium villages with the lowest repayment rates were Uranga (29 percent), Ramula (23 percent) and Anyiko (16 percent). The overall repayment rate was 38 percent, which was quite low. The low repayment rate had implications for further funding for interventions in agriculture in the MVP, given that there were no additional funds for lending to farmers, especially those who had defaulted on their payments.

Table 4.4: SAGA loan repayment rates by millennium villages in US$ (as of 2009)

Millennium village	Amount of loan	Net repayment	Repayment rate
Nyawara	44,221	19,877	45%
Nyandhiwa	52,633	25,986	49%
Sauri	60,498	21,312	35%
Jina	48,255	25,586	53%
Nyamninia	51,244	22,029	43%
Marenyo	58,958	27,886	47%
Ramula	80,365	18,572	23%
Lihanda	52,504	25,314	48%
Gongo	53,680	28,830	54%
Uranga	48,286	13,903	29%
Anyiko	80,076	12,901	16%
Total	630,719	242,197	38%

Source: MVP records

The varied performance between SAGA and MVP loans can be attributed to two issues. First, MVP credit support was individual-based, while SACCO only loaned to groups, which minimized the credit risk. Because of limited information on the credibility of the borrowers, the rate of defaulting was expected to be higher for individual lending as compared to lending to groups. Secondly, we found that the transition to the credit system by the MVP was not properly done. A majority of those interviewed alluded to the fact that the MVP did not sensitize the farmers on the terms and conditions of the loans and some farmers were recruited into the scheme without payment of the required membership fee. Apparently, the MVP was working within set timelines and targets and therefore underestimated the risk of giving out loans without proper evaluation of the individuals' ability to repay the loans. As a result, some farmers deliberately failed to repay the loans because they felt that it was free money, while some were genuinely unable to repay.

The MVP also linked farmers to another microfinance institution called the Rabuor Sinaga Community Fund. The fund was launched in 2002 with the objectives of mobilization of financial resources and enhancement of access to finance. It offers services such as deposits of savings, credit facilities, money transfers and financial advisory services. Credit facilities include loans for business, school fees, financing asset acquisition, agricultural diversification (bee-keeping and poultry), installation of electricity and emergency loans. Membership fees were about US$ 4, in addition to group meeting minutes, if group registration. It had over 2,000 members in 2009, consisting of individual members, youth groups, women's groups, church organizations and community-based organizations. Individuals/groups could save as low as 50 KES (US$ 0.57) and withdraw anytime, with withdrawal charges being 20 KES (about US$ 0.2) for withdrawals of less than 10,000 KES (US$ 115) and 100 KES (US$ 1.1) for withdrawals over 10,000 KES. Members also paid a quarterly account maintenance fee of 20 KES. These charges were quite low compared to average formal bank charges in Kenya. In addition to lower charges, members did not require collateral to get loans, which were approximated at four times the amount of shares/savings. Interest on loans was 10 percent for a repayment period ranging from six to nine months and 15 percent for a repayment period ranging from nine months to one year. These lending rates are higher than the average lending rates by SACCOs in Kenya (an average of 12 percent per annum) but lower than the lending rates by commercial banks. The fund has been attractive, given its potential of generating resources through mobilization of rural savings, which is necessary for investment in income generating activities, which would in turn lead to poverty reduction and rural development.

The Rabuor Sinaga Community Fund collaborated with the MVP in enhancing access to credit for farming, especially bee-keeping and poultry. The MVP sensitized farmers on diversification into bee-keeping and poultry and linked them to the fund to acquire credit for the investment. Consequently, the fund saw an increase in membership and also in the scope of activities. However, with increased credit facilities, statistics from the fund showed that repayment rates declined from about 100 percent before the MVP to about 65–75 percent after the MVP. For MVP activities (bee-keeping and poultry farming), repayment of loans given to farmers in December 2008 was only 29 percent

by August 2009. The low repayment was largely attributed to two reasons. First, farmers depended solely on returns from agriculture to repay the loans, which implied that they could not repay the loan when the harvests were poor. Also, some ventures such as bee-keeping required longer periods to reach maturity, which delayed repayments. Secondly, like the case for loans through SAGA, it was felt that the farmers were not properly sensitized before taking the loans, given that they thought it was an MVP subsidy that did not require repayment.

The fund, on the other hand, had clearly established procedures for dealing with loan defaulting. Initially, the defaulter would be given a chance to explain the reasons for defaulting and, if satisfactory, would be granted an additional repayment period and have the interest payments waived. If the reasons were not satisfactory, then the member would be granted additional repayment time but the interest payments would not be waived. Loan defaulters would be summoned for a maximum of two times, after which the fund would engage debt collectors to recover the money and the respective members would be disqualified from the fund.

By the third and fourth year of MVP interventions, farmers were linked to a commercial bank (Equity Bank) to source loans for financing inputs (MVP, 2011). However, there have been conflicting reports by the MVP with regard to the number of farmers who were able to access credit from the banking institutions. According to the MVP (2009a), about 927 farmers were able to access loans from Equity Bank and more than 7,000 farmers were linked to commercial financial institutions. Another MVP report (MVP, 2009b) indicated that only 67 farmers received loans for purchasing inputs from Equity Bank in 2009. The MVP (2009b) further acknowledges that relatively few of the farming households were able to benefit from credit from financial institutions because of a lack of marketable collateral and personal guarantee requirements. It is in light of these constraints that the operation of small revolving funds and village saving and loan programs among groups were facilitated (even though most of them were in existence before the MVP), with an aim of the administration of small loans to members. No collateral is required for the village savings and loan groups, and loan repayment has been found to be very high, estimated at 98 percent in 2009 (MVP, 2009b).

Our survey results reveal that more households in the millennium villages accessed credit as compared to the control villages. About 29 percent of the sampled households within the millennium villages accessed credit, as compared to only 10 percent of the sampled households within the control villages. The test of significance of the difference in means in access to credit between millennium villages and control villages showed that access to credit was statistically significantly higher in millennium villages than in the control villages, with a t-value of 4.86. Thus, it can be seen that MVP interventions enhanced access to credit within the millennium villages. However, even though there were gains in access to credit, these gains were not sustained, as discussed above.

We carried out regression analysis using logit to assess the factors that determined access to credit in Sauri. Regression results are summarized in Table 4.5. We estimated equations for the total sample, millennium villages and the control group. The results for both the total sample and millennium villages reveal that more educated household heads with larger parcels of land were less likely to apply for credit than the less educated ones with smaller parcels of land. Land ownership is a significant factor influencing access to credit in millennium villages. This is because land is the most common tangible asset that could be used as collateral for loans, but only if there is legal ownership (through a title deed).

High cost of borrowing was found to be a key constraint to access to credit in the control group and total sample. It was not a significant constraint among the millennium villages mainly because the households did not consider the cost of borrowing when applying for credit, given the notion that the MVP had subsidized the loans. Lack of collateral was also found to be a significant deterrent to access to credit in both millennium villages and the control group. It was revealed that most households were hesitant about using their small parcels of land as collateral because of fear of losing them in case of loan defaulting, which would lead to a loss of their main source of livelihood. Access to a credit facility was also a significant deterrent to access to credit in the control group but not in the millennium villages. Lastly, male-headed households in the millennium villages were more likely to access credit than the female-headed

households. This is mainly because assets which can be used as collateral (such as land) are registered in men's names within Sauri, which is a customary tradition.

Table 4.5: Logit regression of determinants of access to credit

	Total	Millennium villages	Control
Sex of household head	0.493	0.728***	0.659
Age of household head	-0.201	-0.229	-0.188
Education of household head	-0.092**	-0.103***	-0.009
Land size	-0.430***	-0.667***	0.192
Land ownership	0.178	0.690***	-0.355
Cost of borrowing	-0.954**	-0.070	-2.718*
Collateral	-1.108*	-0.908**	-1.800**
Access to credit facility	-0.556	0.537	-2.538*
Constant	2.887*	1.790	3.504
Number of observations	391	215	176
LR chi2(8)	34.03	27.5	15.18
Prob > chi2	0.0	0.001	0.056
Pseudo R2	0.086	0.106	0.136

*, ** and *** stand for 1 percent, 5 percent and 10 percent significance levels, respectively.

Note that the standard errors are robust.

4.6 Discussion

Following the findings from Chapter 2, this paper sought to assess whether inefficiencies in economic institutions (specifically input, output and credit markets) could have undermined the effectiveness of the MVP in enhancing agricultural productivity and income for the households. From our findings, we conclude that some institutional bottlenecks undermined the achievement of the MVP goals. While the MVP had a significant impact on agricultural productivity, the sustainability of these gains

was undermined by inefficiencies in input and credit markets. Further, the translation of increased agricultural productivity into cash income depended on access to efficient output markets.

From Chapter 2, the gains in increased agricultural productivity were mainly attributed to enhanced access to farm inputs (seeds and fertilizer). Efforts were made by the MVP to increase access to inputs through an input subsidy in the first year and increased access to credit for purchasing inputs from the second year. While significant gains were made when a full subsidy on inputs was granted in the first year, the transition into credit financing for inputs through the formal banking system was not successful, given that fewer than 10 percent of the farmers were able to access formal credit for inputs. As a result, most farmers who could not afford to purchase inputs reverted back to traditional farming methods. This greatly undermined the efforts to increase agricultural productivity through increased use of improved inputs. An assessment of the evolution of the use of input subsidy programs in Sub-Saharan Africa reveals three important aspects that are important for the success of interventions in access to inputs. First, while there is consensus that use of inputs (especially fertilizer) must be increased for Africa to meet its agricultural growth and poverty reduction targets, low input usage is not the only problem plaguing African agriculture. Ricker-Gilbert, Jayne and Shively (2013) argue that the question of whether inputs (specifically fertilizer) should be subsidized is a "wicked problem," given that such programs are multidimensional and their impacts are difficult to isolate or measure. While interventions to increase input usage might be necessary, they must have a longer term perspective as opposed to short-term interventions aimed at causing immediate and temporary increases in input usage, which have been found to be ineffective (Morris et al., 2007). Further, input subsidies have been shown to offer limited prospects of a lasting solution to inadequate input access because simply making available cheaper or free inputs does not provide a basis for the development of sustainable market-led input distribution systems. Second, as part of being a smart subsidy, subsidies should be targeted at households that are not using the inputs but would find it profitable to use them (Morris et al., 2007; Jayne and Rashid, 2013). There is wide consensus that universal input subsidies in Africa were ineffective in stimulating demand for inputs, enhancing agricultural productivity and

reducing poverty (Morris et al., 2007). Third, there is a need for a clear exit strategy that ensures that the gains from the input subsidy are sustained. Denning et al. (2009), in their review of the input subsidies in Malawi, concurred that abrupt downscaling of subsidies would reverse the gains made in enhancing food security and called for gradual reductions in subsidies that would be replaced by smallholder-focused rural credit systems. Even though empirical support is scant (Jayne and Rashid, 2013), our findings support the argument that smallholder farmers are likely to revert back to pre-subsidy behaviors and welfare levels unless a clear and sustainable exit strategy is implemented. The reversal would undermine the effectiveness of agricultural interventions that are aimed at enhancing agricultural productivity and boosting household income, as experienced by the MVP. In addition to input subsidies, it has been shown that the timing of income at harvest and purchasing of inputs also matters (World Bank, 2015). Farmers typically receive income after harvest, but they are required to purchase inputs at a later date, sometimes after several months. Interventions aimed at offering free delivery and purchase of inputs at the time of harvest have proven successful, as demonstrated by Duflo, Kremer and Robinson (2011, cited by World Bank, 2015) in their experiment in rural Kenya.

We have also shown that credit constraints still remained major impediments to the achievement of MVP goals. Access to credit in Sauri before the MVP was largely through informal sources and remittances. We found that one of the major constraints to access to formal credit was the lack of collateral, which was not adequately addressed by the MVP when making the transition into credit financing through the formal banking system. Institutional innovation in terms of providing alternatives to tangible collateral is necessary for such interventions in access to credit to succeed. We consider the example of Grameen Bank, which developed its own method of tackling the problems of asymmetric information and imperfect enforcement that characterize rural credit markets by providing substitutes for collateral, such as lending to groups, whereby local social capital is used as a substitute for wealth as collateral (WDR, 2008; Hossain, 1988; Khandker, Khalily and Khan, 1995). The shared liability of loans reduces risks of defaulting through a more a rigorous peer selection of group members. Under Grameen Bank, loan disbursements were sequenced in a way that subsequent group members

would only receive their loans if their fellow group members who were the first to receive their loans met their regular repayment schemes. In this way, a combination of peer pressure and solidarity form an important and effective source of collateral (Develtere and Huybrechts, 2002). Consequently, loan repayment for Grameen Bank has been estimated to be over 90 percent. Some of the successful input credit programs in Africa have also used crops as collateral for input loans (Morris et al., 2007), even though collateralizing crops would work better for cash crop farming as opposed to subsistence farming. Stored output (like for the cereal banks) can also be used as collateral for short-term credit, which can be used to cover post-harvest expenditures as opposed to selling output at low prices. In addition to innovations for collateral, Grameen Bank also succeeded because of several factors, including: taking the bank to the people rather than taking the people to the bank, supervision of loan utilization, recovering of loans in small weekly installments and developing collective funds with compulsory savings from individuals (Hossain, 1988; Khandker, Khalily and Khan, 1995).

The MVP encouraged group savings and financing by linking farmers to community savings and credit organizations, following the low uptake of formal credit. However, there was also low loan repayment in the community savings and credit organizations, occasioned by over-reliance on agricultural ventures to repay the loans, some of which took longer periods to mature. Also, in line with empirical support (Besley, 1994; Ray 1998), credit markets in Sauri can be said to be segmented, as the farmers faced similar shocks, given the over-reliance on agriculture. Previous evidence reveals that efforts to increase smallholder farmers' access to credit must take into consideration particular characteristics of African farming systems, including: variable or seasonal production systems, limited collateral to secure loans, weak institutions for contract enforcement and higher transaction costs (especially information and administrative costs) for small credit transactions (Morris et al., 2007). Experience has also shown that SACCO's lending to groups will work better if the credit is channeled towards a diversified portfolio of activities, as opposed to crop activities that share the same weather conditions and gestation periods (World Bank, 2007).

In addition, we found that the input and credit markets were interdependent, with inefficiencies in credit markets greatly undermining the success of interventions in input markets. Previous evidence revealed that enhanced access to inputs (seeds and fertilizer) in Asia and parts of Latin America was successful because it was accompanied by complementary investments, especially in financial services and marketing infrastructure (World Bank, 2007). These complementary institutions are small or nonexistent in most African countries. For Sauri, we noted that the interventions in the complementary institutions were not successful.

Our evaluation of output markets reveals that most farmers produced for self-consumption and had limited surplus for selling. Most farmers who sold their produce sold low (immediately after harvest), bought high and largely depended on the nearest markets, with higher cases of informal trading arrangements with neighbors. Because of over-reliance on agriculture, most farmers sold low and bought high mainly because of liquidity constraints. Stephens and Barrett (2011), in their study on smallholders in western Kenya, also found that of the nearly 30 percent of the sample that were net maize sellers in the harvest period, 62 percent were net maize buyers a few months later, a trend that was prevalent in 113 of 137 villages in the sample. These findings have been supported in literature by Barrett (2008), Alene et al. (2008) and Jayne, Mather and Mghenyi (2010), who showed that there is a low level of participation in markets for staples by smallholder famers in East and Southern Africa, which is mainly constrained by low surplus production. Even though regular and sharp price fluctuations are a common characteristic of staple grain markets like for Sauri, smallholder farmers are not able to take advantage of the inter-temporal arbitrage opportunities, as they often sell their output at low prices after harvesting and buy back similar commodities after a few months at higher prices (Stephens and Barrett, 2011). Stephens and Barrett (2011) also attribute the selling low and buying high to liquidity constraints that drive poor households to use commodity markets as a substitute for their inadequate access to financial markets.

Further, transaction costs are important in determining the efficiency of output markets. Our analysis revealed that only the transaction costs that were associated with

knowing the price before going to the market, the ability to pay for the goods immediately (which largely reflected liquidity constraints) and damaging of goods during transportation to the market were significant determinants of market access. There is evidence that has shown that access to agricultural markets, related improvements in rural infrastructure and marketing institutions that lower transaction costs are essential for the development and transformation of subsistence-oriented smallholder agriculture (Zeller, Diagne and Mataya, 1997). However, for Sauri, we find that in general, marketing of output was not a key impediment to the achievement of MVP goals. Inadequate supply (as discussed in Chapter 2), which was mainly attributed to small land sizes and large household sizes, largely undermined the translation of increased agricultural productivity into higher household incomes. This finding has also been supported in literature by Shiferaw, Obare, and Muricho (2006), who found that collective marketing activities in Eastern Kenya were constrained by low volumes and price variability.

With regard to enhancing output markets by creating marketing cooperatives, we found that the cereal banking concept was not successful. However, as the MVP transitioned from the cereal banking concept to the market service center, it was not clear whether the challenges that were faced by cereal banks were addressed when setting up the cooperatives. Research has shown that cooperation in market access through collective action is crucial for poor smallholder farmers to overcome challenges related to unfavorable policies and market conditions and to create sustainable livelihood options (Meinzen-Dick et al., 2009; Wiggins, 2009; Alene et al., 2008). However, experience has shown that collective action requires an enabling environment to succeed, especially with regard to the characteristics of markets and products, characteristics of groups and the institutional environment. Collective action will not offer significant gains if smallholder farmers largely sell their produce (especially staple foods) in local markets, as was the case of Sauri (Markelova and Meinzen-Dick, 2009; Alene et al., 2008; Jayne, Mather and Mghenyi, 2010). Group dynamics also play a significant role in the success of collective action. Most successful groups have an average group size of 20-40, with similar socio-economic status (Markelova and Meinzen-Dick, 2009). However, the size of the group was not a very important factor in Sauri, given that the only cereal bank

that succeeded had membership of about 260. Lastly, the success of collective action efforts also depends on the establishment of proper accountability and enforcement mechanisms. For Sauri, while each cereal bank was guided by a constitution that was drafted by the members (with input from the MVP), the mechanisms for accountability and enforcement were either weak or lacking. This was a major factor that contributed to the collapse of the cereal banks.

In conclusion, while enhancing agricultural productivity, commercializing agriculture and promoting the nonfarm economy are important in enhancing rural household income and reducing poverty, our findings show that access to rural markets (input, credit and output) could provide the missing link. If not adequately addressed in the design of rural development interventions, inefficient markets could act as significant deterrents to the achievement of intervention goals.

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Chapter 5: Conclusions, Lessons and Areas for Further Research

The Millennium Villages Project had far-reaching objectives, with an overall goal of ensuring that the target villages achieved the millennium development goals by 2015, which marked the end of the project. While the project entailed a substantial amount of resources, there was no rigorous impact evaluation over the 10-year period. The publicity with regard to the quick gains of the project was the main motivation of this thesis, which sought to assess the impact of the MVP on two key outcomes: agricultural productivity and household income. The thesis also assessed the mechanisms used to provide insights into the strengths and weaknesses of the project.

The thesis found that the project had a significant impact on agricultural productivity, which significantly increased self-consumption and consequently improved food security and nutrition. However, we found that the effect on household cash income was insignificant. The important link of translating the increased agricultural productivity into higher income, which was necessary for the transition from subsistence farming into commercial farming and diversification into the nonfarm economy, was missing. This was further explained by structural factors, mainly large household sizes and smaller parcels of land. Further analysis revealed that the MVP did not succeed in enhancing diversification among Sauri households, with key push factors still being the household size and the size of land. We also found evidence of households with higher levels of diversification benefiting less from the MVP interventions, which pointed to the MVP's emphasis on agricultural interventions. Even though access to markets was necessary to enable a transition from subsistence farming to commercial farming and diversification into the nonfarm economy, we found that inefficiencies in the input and credit markets still existed after MVP interventions. The smallholders were still not able to afford the purchase of inputs, as they could not access credit, largely due to a lack of collateral, which the MVP did not address during the interventions. Interventions in output markets, especially the cereal banking concept, was also unsuccessful. We provide a summary of the conditions before and after the MVP with regard to the areas of interest of the study in Table 5.1.

Table 5.1: Summary of interventions and outcomes

Before MVP	MVP Interventions	After MVP
Low agricultural productivity	Increased use of fertilizer and improved seeds	Significantly higher agricultural productivity
Low access to inputs	Enhanced access to inputs through input subsidy and increased access to credit for purchasing inputs	Gains were not sustained. There was a reversal to the initial status of using traditional farming methods and low-input usage, mainly attributed to financial constraints.
Reliance on subsistence farming	Diversification into higher value crops and nonfarm economy	No significant change.
Low access to credit	Enhanced access to credit through microfinance institutions and banks	No significant change because initial constraints (lack of collateral and high borrowing costs) were not addressed.
Inefficient output markets	Set up cereal banks and a market service center	10 of the 11 cereal banks collapsed. The market service center was at its initial stages of operation at the time of the survey, but there were indications that it would face similar challenges as those the cereal banks did.
Low household income and high poverty	Income was to increase through increased agricultural productivity	No significant change.

	and diversification into higher value crops and the nonfarm economy	

We acknowledge, however various limitations of our study. First, given that the MVP was not an experimental project, there was no baseline data. The use of matching methods does not provide accurate and precise estimates as compared to experimental designs partly because of the failure to take into consideration the effect of unobserved variables. Secondly, the study would have benefited from a larger sample size, given that larger sample sizes lead to lower standard errors. Also, the use of longitudinal data would have yielded better outcomes. However, the study used a one-period smaller sample largely due to financial constraints. The MVP end project evaluation is also likely to face the limitations of using non-experimental designs.

Several key issues emerge from our evaluation of the MVP. First, the design of the study is important in facilitating the impact evaluation of the project. The true impact of the project can be derived from well-designed projects that are experimental (randomized controlled experiments) and that incorporate the collection of longitudinal data (including baseline and periodical data on the various indicators of measurement). The MVP's design provides various challenges for impact evaluation not only because of the lack of a baseline, but also because most of the midterm reports focused more on a narrow range of indicators (especially health outcomes) as opposed to providing a measure of indicators such as expenditure and income that are crucial in assessing whether the objective of poverty reduction was achieved. A good example of a randomized controlled experiment is BRAC's project on "Challenging the Frontiers of Poverty Reduction: Targeting the Ultra Poor (CFPR-TUP)."

Secondly, a key factor that has been shown to undermine the effectiveness of rural development interventions is the failure to test the assumptions of the theory of change. For Sauri, we have shown that the assumption of translating the gains in agricultural productivity into higher household income did not hold. Proper testing of assumptions

and reviewing of mechanisms can facilitate the re-design of projects in the midterm to ensure project effectiveness. Finding the most effective interventions requires an experimental approach that includes testing of different approaches (World Bank, 2015).

Thirdly, a key concern of rural development projects is sustainability. We look at sustainability in two ways. The first is whether the gains of the project can be sustained beyond the project period. For Sauri, we found that the gains in agricultural productivity were sustained. Even though the use of inputs declined, the sustained average productivity gains can be attributed to improved soil fertility as a result of the use of fertilizers (though in smaller proportions) and also the knowledge gained from training in improved farming practices (e.g. intercropping with high-nutrient crops). The gains in markets (especially input and credit markets) were not sustained mainly because of the failure to address the key existing constraints, especially the lack of collateral to access credit and the low loan repayments occasioned by over-reliance on agricultural ventures (resulted in higher lending risks). Second, sustainability beyond the project period can be made possible through (i) increasing household incomes beyond subsistence and building an asset base and (ii) collaboration with respective governments to ensure that governments take over the role of running the project at the end of the interventions. For Sauri, we conclude that sustainability will not be guaranteed. First, household incomes did not increase beyond subsistence levels, which is partly because diversification into both commercial farming and the nonfarm economy was not achieved. Second, while the MVP envisaged collaborating more closely with the local government and also positioning its efforts in line with the government's rural development plans to ensure further scaling-up and sustainability, this was not achieved in Sauri. The local government offices within Sauri were located in close proximity to the MVP offices. However, there was no collaboration between the two offices, except when government officials were called upon to welcome high-profile visitors. Further, there was no evidence of linking MVP to the rural development plans. A look at the Integrated Development Plan for Siaya County (where Sauri is located) acknowledges the existence of the MVP within the county but does not make an effort to the link the MVP initiatives to the county's development agenda.

A key area for further research is an independent end-term evaluation of the MVP, with greater focus on changes in household income, poverty and overall well-being of Sauri households. A detailed cost effectiveness analysis would also be important in shedding light on the value for money, which is an important factor to consider in development interventions.

Appendix 1: Gem Poultry Farmers' Co-operative Society Limited By-Laws

Objectives

The objective is to organize and promote the welfare and economic interests of its members. In particular, the society shall undertake:

a) To arrange for co-operative marketing processing, grading, packaging and transporting the members produce and such other operations as may be necessary for the most profitable disposal of the produce; b) to arrange for the purchase and resale of farm inputs and chemicals and other similar requirements of the members; c) to take measures to control pests and diseases; d) to foster education and training to members, committee members and employees; e) to provide co-operation and good will between members and the society; f) to co-operate with other co-operatives in order to promote members interests and in furtherance of the society's objectives.

Co-operative principles and values

In order to achieve its objects the society shall act in accordance with the following Co-operative principles and relevant values.

Principles

(a) The society shall always be guided by the principle of voluntary and open membership in its member recruitment drives without political, religious, ethnic, gender or social discrimination. (b) The society will be fully controlled by members who will have equal voting rights on the basis of one member one vote. (c) Members shall contribute equitably to the capital of the society and share in the results of its operations. (e) The society shall operate on mutually acceptable terms with its stakeholders who will ensure its autonomy and independence. (f) The society shall foster reciprocal, on–going education programs for members, leaders, staff and the community so that they can teach and learn from each other or from the appropriate resource persons in understanding and carrying out their respective roles. (g) In order to better serve the interests of the members and the community, the society shall

actively co-operate with other co-operatives locally, regionally, nationally and internationally.

Values

The values shall be self-help, mutual responsibility, equality and equity. It shall practice honesty, openness and social responsibility in all its activities.

Membership

A person shall be eligible for membership if he/she:

a) Ordinarily resides or owns land within the society's area of operation, namely Gem District, Siaya County; b) is of good character and sound mind; c) has attained the age of 18 years except in case of a minor who is heir to a deceased member; d) grows or has products capable of being marketed in accordance with these by-laws, namely poultry and poultry products; e) is not a member of another co-operative society carrying out the same activities in the same area of operation; f) pays entrance fee and minimum share capital as prescribed in these by-laws. Every member shall hold at least 75 shares of KES 20 each as shall be fixed by the General Meeting. However, no member shall hold more than one-fifth of the total shares of the society.

Transfer of shares

a) With the approval of the Management Committee, a member may at any time transfer his shares to another member but not to any other person. Such transfers must be in writing and at nominal value. The transferee shall be charged for the transfer.

b) All transfers of shares between members shall be registered with the society and no transfer shall be valid unless so registered. A fee of KES 500 shall be payable by the transferee for each such transfer.

Rights of members

A member of the society shall have the right to:

a) Attend and participate in decision-making at all general meetings of the society and vote; b) be elected to organs of the society, subject to these by-laws; c) enjoy the use of all the facilities and services of the society subject to the society's by-laws; d) all

legitimate information relating to the society, including: internal regulations, registers, minutes of general meetings and supervisory committees, reports, annual accounts, inventories and investigation reports, at the society's registered office.

Funds of the society

The funds of the society shall consist of: entrance fee; share capital; administration fees and penalties; statutory reserve fund and any other reserve fund as may be kept by the society; surplus resulting from the operation of the society; and any donations, gifts from other bodies, organizations and individuals.

The funds of the society shall be applied to the promotion of the stated objects of the society as set out in these by-laws and purpose set out in the Act and Rules and shall be invested in:

a) Investments and securities as are authorized for the investment of trust funds; b) the shares of any other co-operative society; c) any bank licensed under the Banking Act; d) the stock of any statutory body established in Kenya or in any limited liability company incorporated in Kenya or in any other manner approved by a resolution at a general meeting of the society.

Appendix 2: Household Questionnaire

Part I: Household Characteristics				
1.1	Area of residence (village)			
1.2	Sex of respondent	Male	1	
		Female	2	
1.3	Are you the head of household?	Yes	1	
		No	2	
1.4	If not the head, what is your relation to the head of the household?	Spouse	1	
		Son	2	
		Daughter	3	
		Relative	4	
		Other	5	
1.5	Marital status	Single	1	
		Married-Monogamous	2	
		Married-Polygamous	3	
		Divorced/separated	4	
		Widowed	5	
1.6	What is your age?			
1.7	If respondent is not a household head, what is the age of the household head in years?			
1.8	Level of education of household head	None	1	
		Primary school	2	
		Secondary school	3	
		College	4	
		University degree	5	
1.9	What is the occupation of the household head?	Not employed	1	
		Professional worker	2	
		Administration & managerial	3	
		Clerical/sales	4	
		Support staff	5	
		Other (specify)	6	
1.10	Household size		Male	Female
		0 - 5 years		
		6 - 18 years		
		18-55 years		
		> 55 years		
1.11	Number of children schooling		Boys	Girls
		Primary (Std 1-4)		
		Primary (Std 5-8)		
		Secondary		
		College		
		University		
1.12	Number of economically active		Male	Female

	members of the household	Unpaid family worker		
		Self-employed/small-scale business		
		Wage employment		
		Other (specify)		
1.13	Number of non-active members of the household	Males		
		Females		
1.14	What is the reason for being inactive?	Too young	1	
		Too old	2	
		Sick	3	
		Disabled	4	
		Other (specify)	5	
1.15	Type of house	Permanent (stone wall, tin roof)	1	
		Semi-permanent (mud wall/tin roof)	2	
		Temporary (grass roof and mud wall)	3	
1.16	Household assets (more than one answer allowed)	Radio	1	
		Television	2	
		Bicycle	3	
		Mobile phone	4	
		Water tanks	5	
		Motor vehicle	6	
		Other (specify)	7	
Part II: Socio-economic characteristics				
2.1	What is the key source of livelihood for the household?	Agriculture	1	
		Small scale business	2	
		Wage employment	3	
		Other (specify)	4	
2.2	What are the major constraints to your family's well-being?			
2.3	Do you practice farming?	Yes	1	
		No	2	
2.4	What is the acreage of the farm?			
2.5	How many plots of land do you have?			
2.6	Who owns the land?	Household head	1	
		Extended family	2	
		Leasehold (rented)	3	
		Leasehold (sharecropping)	4	
		Other (specify)	5	

2.7	If land is owned, how did you acquire the land?	Inherited	1	
		Bought it	2	
2.8	Do you have a formal title deed for the land?	Yes	1	
		No	2	
Part III	**Production activities**			
3.1	In terms of crops, what are the main crops that you grow?	Maize	1	
		Beans	2	
		Sweet potatoes	3	
		Bananas	4	
		Cassava	5	
		Sorghum	6	
		Millet	7	
		Ground nuts	8	
		Kales	9	
		Tomatoes	10	
		Onions	11	
		Other (specify)	12	
3.2	How much on average do you spend on the following production activities for one planting season of, say, maize?		Qty-Kgs/no. of days	KES
		Seeds		
		Fertilizer		
		Land preparation		
		Planting		
		Weeding		
		Harvesting		
		Other (specify)		
3.3	If purchasing inputs, where do you source the inputs?	Local market	1	
		District headquarters	2	
		Outside district	3	
3.4	What would you say are the constraints you face in terms of access to inputs?	High cost of inputs	1	
		Too few sellers	2	
		Poor quality of inputs	3	
		Other (specify)	4	
3.5	What is the main source of labor for your farm?	Unpaid family labor	1	
		Hired labor for pay (money)	2	
		Hired labor for payment in kind	3	
3.6	How many days does it take to cultivate your land?			
3.7	How much on average is the daily wage rate for working on the farm?	KES		
3.8	How much on average are you able to harvest on your farm annually?		Yield (Kgs/bags)	
		Maize		
		Beans		
		Sweet potatoes		

		Bananas	
		Cassava	
		Sorghum	
		Millet	
		Ground nuts	
		Kales	
		Tomatoes	
		Onions	
		Other (specify)	
3.9	If in the MVP, how much on average were you able to harvest on your farm annually before the MVP?		Yield (Kgs/bags)
		Maize	
		Beans	
		Sweet potatoes	
		Bananas	
		Cassava	
		Sorghum	
		Millet	
		Ground nuts	
		Kales	
		Tomatoes	
		Onions	
		Other (specify)	
3.10	From the output, how much on average is for home consumption?		Yield (Kgs/bags)
		Maize	
		Beans	
		Sweet potatoes	
		Bananas	
		Cassava	
		Sorghum	
		Millet	
		Ground nuts	
		Kales	
		Tomatoes	
		Onions	
		Other (specify)	
3.11	On average, how long does this food supply last you (in months) before the next harvest season?		
3.12	If the output does not last for a full year, how many months on average do you have to look for additional cereals, such as maize?		
3.13	What quantity on average do you buy per month (for instance, maize)?		
3.14	Would you rely on relatives and/or friends in the village to give you supplies	Yes	1

	in case your supplies ran out?	No	2
3.15	Do you have surplus for selling? If no, skip to section IV.	Yes	1
		No	2
3.16	If yes, where do you sell your output?	Small traders at local market	1
		Wholesalers at local market	2
		National cereals board (local branch)	3
		Traders within district	4
		Traders outside district	5
		Export outside Kenya	6
3.17	How much did you sell last year, for instance?		Quantity (Kgs/bags)
		Maize	
		Beans	
		Sweet potatoes	
		Bananas	
		Cassava	
		Sorghum	
		Millet	
		Ground nuts	
		Kales	
		Tomatoes	
		Onions	
		Other (specify)	
3.18	How much, on average, is the price of the output? Indicate the unit of measurement (e.g. per kg, korokoro, debe (approximately 16kgs), 50kg bag, 90kg bag, etc.).		Price (KES)
		Maize	
		Beans	
		Sweet potatoes	
		Bananas	
		Cassava	
		Sorghum	
		Millet	
		Ground nuts	
		Kales	
		Tomatoes	
		Onions	
		Other (specify)	
3.19	Who determines the price of the output?	Myself	1
		The buyer	2
		Both buyer and seller	3
3.20	What constraints do you face when accessing markets to sell your output?	Poor output prices	1
		Lack of adequate demand	2
		High transport costs	3
		Other (specify)	4

3.21	If you had output to sell, do you always know the prevailing market price before going to the market?	Yes	1
		No	2
3.22	At what point do you get to know the market price?	Before going to the market	1
		At the time of sale	2
3.23	Have you ever sold your produce at a much lower price than you had anticipated?	Yes	1
		No	2
3.24	Have you ever damaged your goods when transporting them to the market?	Yes	1
		No	2
3.25	If yes, please quantify the damage (in quantity (kgs) or KES. Please specify the type of commodity.		
3.26	How long do you usually wait at the marketplace before selling your goods?	<6 hours	1
		>6 hours	2
3.27	When selling your produce, when do you get paid for the produce?	Immediately	1
		Later	2
3.28	If later, how many times do you have to go and see the merchant before receiving your payment?	1 - 3 times	1
		> 3 times	2
3.29	Have you at any point had to recover your goods because of failure to get paid?	Yes	1
		No	2
3.30	What kind of customers do you deal with?	Regular	1
		Irregular	2
Part IV: Participation in MVP project			
4.1	Are you a beneficiary of the MVP? If no, skip to part V.	Yes	1
		No	2
4.2	How many years have you benefited from the MVP?		
4.3	What kind of support have you directly received from the MVP?	Supply of agricultural inputs	1
		School fees bursary for children	2
		Access to health care	3
		Training in agricultural practices	4

		Access to loans/micro finance	5	
		Other (specify)	6	
4.4	In terms of crops, what are the main crops for which the MVP has given you support?	Maize	1	
		Beans	2	
		Sweet potatoes	3	
		Bananas	4	
		Cassava	5	
		Sorghum	6	
		Millet	7	
		Ground nuts	8	
		Kales	9	
		Tomatoes	10	
		Onions	11	
		Other (specify)	12	
4.5	Did you receive any of the following inputs? Circle where appropriate.	Seeds	Yes (1) No (2)	
		Fertilizer	Yes (1) No (2)	
		Other (specify)		
4.6	If yes, how much did you receive over the years?		Seeds (kgs)	Fertilizer (kgs/bags)
		2005		
		2006		
		2007		
		2008		
		2009		
4.7	After receiving inputs from the MVP, it is a requirement that you give back to the project some output. Over the years, have you given back any output to the MVP project?	Yes	1	
		No	2	
4.8	If yes, what quantity did you give back after last year's harvest (indicate unit of measurement)?			
4.9	If no, why did you not give back?	Not willing	1	
		Inadequate output	2	
		Other (specify)	3	
4.10	Who enforces the requirement of giving back the output?			
4.11	Are there any penalties for failure to comply with the requirement?	Yes	1	
		No	2	
4.12	If yes, what is the penalty?			
4.13	A cereal bank was developed to help in storage of output. Have you ever made use of the cereal bank?	Yes	1	
		No	2	
4.14	If no, why?			

4.15	What would you say have been the greatest benefits of the MVP? Multiple answers allowed. Rate your choices.	Increased food supply	
		Lower food prices	
		Increased income generation	
		Better education for children	
		Improved health care	
		Creation of employment opportunities in farms	
		Creation of nonfarm employment opportunities, e.g. in business	
		Improved access to inputs	
		Training in agricultural practices and entrepreneurship	
		Other (specify)	
4.16	Would you say that the MVP has enabled you to generate additional income and save money?	Yes	1
		No	2
4.17	Since the inception of the MVP, have you been able to carry out any new investments?	Yes	1
		No	2
4.18	If yes, what did you invest in?		
4.19	Suppose the MVP project ends; would you be able to sustain yourself financially?	Yes	1
		No	2
4.20	If yes, why?	I acknowledge the benefits of the program and I would work hard to ensure the project continues.	1
		I have generated savings and I can now afford the inputs.	2
		I have acquired the necessary production know-how.	3
		I can access credit/microfinance.	4
		Other (specify)	5
4.21	If no, why?	I don't find it necessary to continue with the project.	1

		I don't have adequate income flow to sustain myself.	2
		Credit facilities are not available.	3
		Other (specify)	4
4.22	What measures have you put in place to ensure environmental sustainability?	Planted trees	1
		Improved fallows	2
		Mixed cropping	3
		Made gullies	4
		Other (specify)	5
4.23	Do you directly participate in MVP decision-making?	Yes	1
		No	2
4.24	If yes, how?		
4.25	How do you communicate with the MVP staff?	No channels of communication	1
		Communicate through community representatives	2
		Hold meetings with MVP staff	3
		Other (specify)	4
4.26	Are you a member of any committee within MVP?	Yes	1
		No	2
4.27	In your understanding, how are the members of the committees selected?		
4.28	Would you say every member of the society is given an equal opportunity when electing members of committees?	Yes	1
		No	2
4.29	Would you freely discuss your grievances (if any) with MVP committee members and staff?	Yes	1
		No	2
Part V: Income, expenditure and savings			
5.1	What are your main sources of income?	Agriculture	1
		Wage employment (farm)	2
		Wage employment (nonfarm)	3
		Small-scale business	4
		Other (specify)	5
5.2	On average, how much income do you get from the following sources in a	Selling output from crops	
		Selling livestock	

	month?	Working on a farm	
		Carrying out small-scale business	
		Employment	
		Being sent money by relative	
		Other (specify)	
5.3	How much on average do you spend on the following items in a typical month?		KES
		Food	
		Household items	
		Other expenditure	
5.4	Do you usually save any money?	Yes	1
		No	2
5.5	How much on average are your monthly savings?		
5.6	Do you have a bank account?	Yes	1
		No	2
5.7	Are you a member of any savings and credit society, women's group or any related associations?	Yes	1
		No	2
5.8	If yes, specify.		
5.9	Have you carried out any investment in the past 3 years?	Yes	1
		No	2
5.10	If yes, what did you invest in? Tick where appropriate.	Household asset, e.g. radio, TV, bicycle, car etc.	1
		Bought agricultural machinery/equipment	2
		Bought land	3
		Started a business	4
		Other (specify)	5
5.11	How much did you spend on the investment?	KES.....	
5.12	What was the source of finance for the investment?	Own savings	1
		Borrowed from friends/family	2
		Informal money lenders	3
		SACCO	4
		Bank	5
		Other (specify)	6
5.13	Have you ever applied for a loan from any financial institution?	Yes	1
		No	2
5.14	If in need of cash, where are you most likely to seek credit?	Family/friends	1
		Informal money lenders	2
		SACCO	3
		Bank	4

		Other (specify)	5
5.15	What constraints do you encounter when applying for credit?	Financial institutions are not easily accessible	1
		High borrowing costs	2
		Lack of collateral	3
		Other (specify)	4